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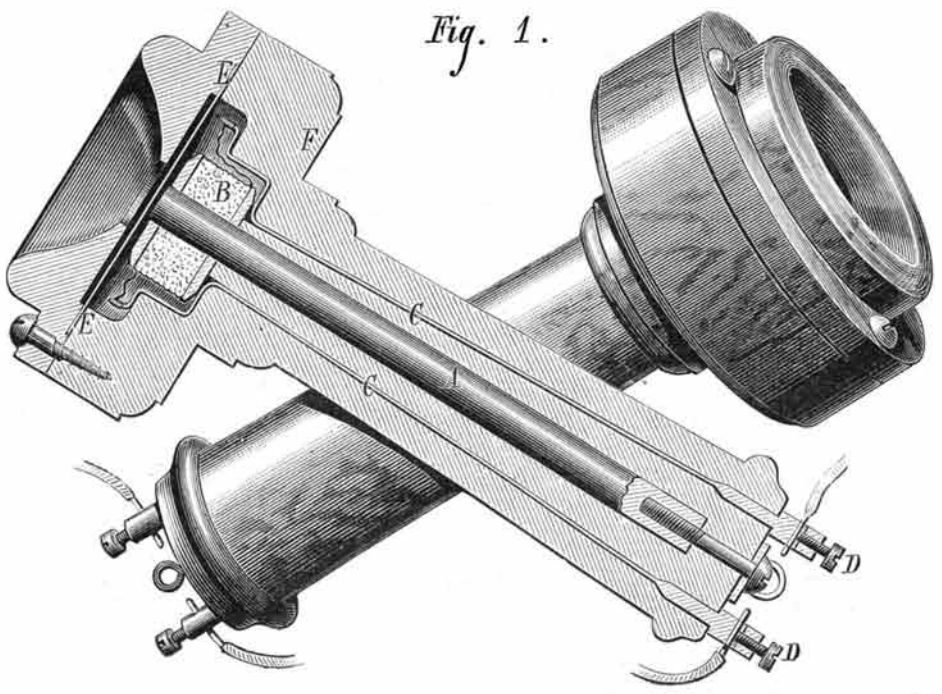
THE NEW BELL TELEPHONE.

Professor Graham Bell's telephone has of late been somewhat simplified in construction and also arranged in more compact portable form. It consists now of but three metal portions and is contained in a casing of wood or light hard rubber, but five and five eighths inches in length and two and seven eighths inches in diameter at the enlarged end. It will be remembered that this telephone differs from all others in that it involves the use of no battery nor of any extraneous source of electricity whatever. The only current employed is that generated by the voice of the speaker himself.

The simplicity of the construction is clearly shown in Fig. 1 of our engravings, in which both sectional and exterior views of the device are given. Referring to the sectional view, A is a permanent magnet, held by the screw shown in the rear. Around one end of this magnet is wound a coil, B, of fine insulated copper wire (silk covered), the ends of which are attached to the larger wires, C, which extend to the rear and terminate in the binding screws, D. In front of the pole and coil, B, is a soft iron disk, E. Finally the whole is inclosed in a wooden casing having an aperture in front of the disk, and which, besides serving to protect the magnet, etc., acts somewhat as a resonator.

Fig. 1.



BELL'S NEW TELEPONE.

The principle of the apparatus we have already explained in some detail, but it may be summarized here as follows: The influence of the magnet induces all around it a magnetic field, and the iron diaphragm, E, is attracted towards the pole. Any alteration in the normal condition of the diaphragm, produces an alteration in the magnetic field, by strengthening or weakening it, and any such alteration of the magnetic field causes the induction of a current of electricity in the coil, B. The strength of this induced current is dependent upon the amplitude and rate of vibration of the disk, and these depend in turn upon the air disturbance made by the voice in speaking, or in any other similar source. Therefore, first, a wave of air throws the diaphragm into vibration; second, each movement produces a change in the magnetic field; and third, an induced

[*Continued on page* 212.]

APPLICATIONS OF PROFESSOR BELL'S NEW TELEPHONE.

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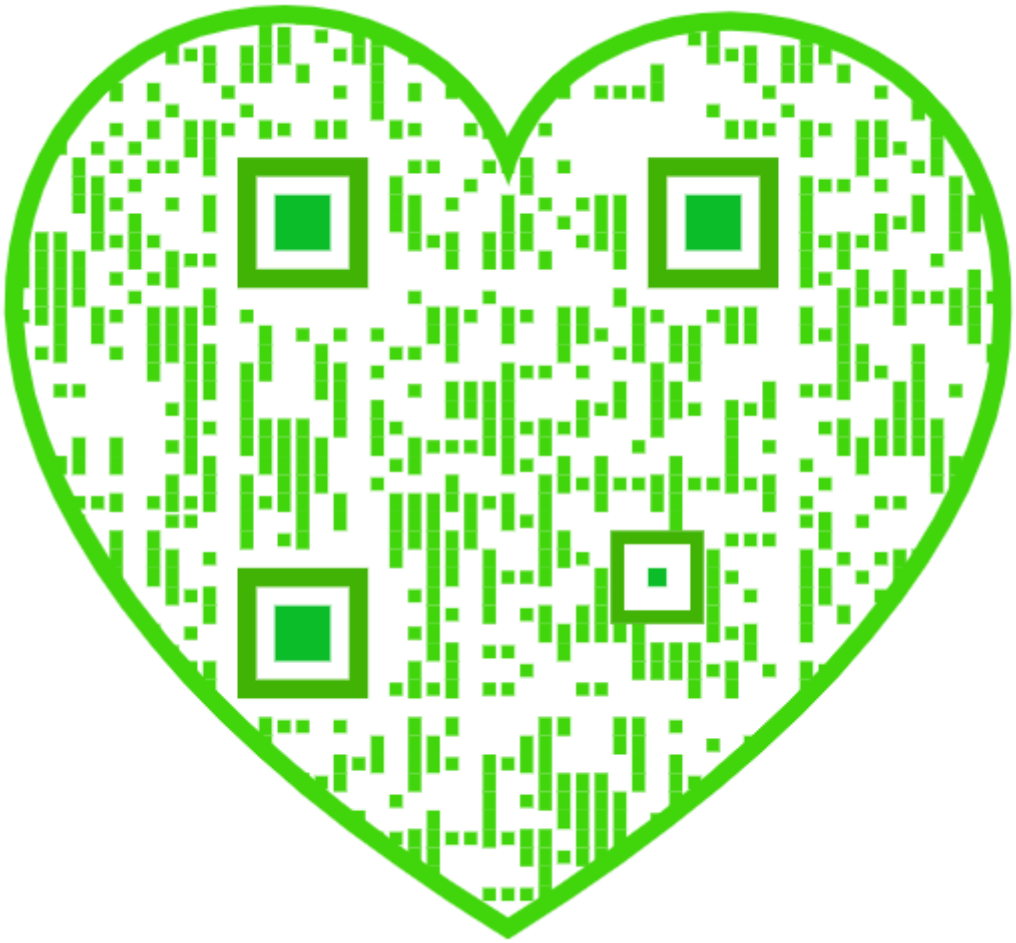

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NEW YORK, SATURDAY, OCTOBER 6, 1877.

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STEAM RAILWAYS IN THE STREETS OF NEW YORK.

The Court of Appeals of New York State has rendered a decision covering the cases before it, based on the questions arising under the State constitution and laws relative to the construction of elevated railways in the city of New York. The sum and substance of the judgment is that existing companies are at full liberty to go on and complete their roads in accordance with the plans modified and approved by the Rapid Transit Commission of this city, and that they are under no necessity of obtaining the consent of the property owners to use the streets for their purpose. The various obstructions placed in the path of these enterprises by courts of inferior jurisdiction are entirely swept away, and the decision, being that of the appellate court of last resort, becomes settled law. The immediate consequences, it is reported, will be the construction of an elevated road on the east side of the city similar to that already in existence on Ninth avenue on the west side, together with branches extending along some of the finest cross streets, and the continuation of the Gilbert Elevated Railway, which has already been begun in West Broadway, over its projected route. Probably other competing lines will also be undertaken.

This result is hailed as "a victory for rapid transit" with scarcely a dissenting voice on the part of the press of the metropolis. We desire none the less to record our disapprobation, and to say, as we have steadily held from the time when the elevated system of city railways was first broached, that in our opinion this mode of transit is unsuited to the wants of the public, unjust to our citizens, open to grave objections from an engineering point of view, and manifestly inferior to other systems, the success of which has been demonstrated by the plainest results of experience. That rapid transit is an urgent necessity admits of no question; but the need is not such as to warrant the hasty conclusion that the end will justify any means. The business welfare of our city depends greatly upon the condition of its streets, and that these should be maintained clear and unobstructed is a measure of public policy even more important than the securing of quick transit. The Elevated Railroad is a serious obstruction, it has proved ruinous to the property past which it runs, and it is an unsightly blemish on the magnificent thoroughfares which now constitute the chief ornament of New York.

We need not go on and multiply objections now that the elevated road has the sanction of law. We simply wish to point out that a project loaded with them has been adopted, in preference to a system in which they are absent. The elevated road and the underground road are now and have been for some time in operation in this city simultaneously, where one was made and has been maintained in the teeth of the opposition of citizens and property owners, the other, which stands as one of the most splendid engineering achievements of recent years, was constructed in accordance with a most urgent popular demand. Residents along Fourth avenue held public meetings to insist that the tracks of the Hudson River and other lines be sunk, and no one for an instant advocated their elevation. Rapid transit trains are now constantly run over this underground road, and people have had the opportunity to judge of its thorough efficiency. In Baltimore and St. Louis, the underground system has been adopted in decided preference and now exists; in London it has been in successful operation for many years, and even in Constantinople, a city destitute in other respects of the most ordinary improvements, the underground railway now furnishes the means of transit.

The subject must now be regarded as singularly anomalous. A project, the feasibility and advantages of which are recognized by the best engineers, which is a demonstrated success and which is objectionable to nobody, is strangely enough deferred in favor of one, the practicability of which is by no means free from doubt, which has afforded only very restricted proof of its benefits, and which meets the strongest disapproval from every one directly affected by it, and numbers its supporters only among those whose property is not likely to be injured by the incursion of its tracks.

THE EXTENSION OF TEA CULTURE.

For a number of years the Department of Agriculture at Washington has been trying, without much success, to induce the citizens of our warmer States to undertake the cultivation of tea. The plant has been successfully grown in a number of States. In many parts of the South and in California, the tea plant thrives quite as well as in its native country. In fact, there is no reason to doubt the capacity of the country to produce all the tea required, certainly for home consumption, and thus keep at home the millions annually paid to the tea-growers of China and Japan. The great obstacle to this extension of home industry appears to be the prevalent impression that, to be successful, tea-growing must be carried on in large plantations. If that were true it would be hopeless to expect ever to compete with the tea growers of China, Japan, and other countries, where labor is plentiful and cheap. That sort of tea-growing is barred out of this country by the high price of labor. But that does not or need not prevent our raising a large, if not the larger, part of the tea we use. Even in China it is the wide and general distribution of the tea plant, not its wholesale culture, that makes the annual crop so large. The two hundred and fifty million pounds a year sent to foreign countries is probably not more than one tenth the amount produced; yet the subordinate part allotted to tea-growing is one of the most striking facts noticed by travelers in the tea-producing districts. Large plantations are few, and six or seven hundred weight is a large annual average for an individual farm. But, while few grow tea on a large scale, every one who has a garden has a few tea trees in the corner of it. In this way millions of trees go to make up the bulk of the tea crop without materially affecting the general agricultural industry of the country. It is rather a domestic industry left to women and children than an integral part of agriculture; and though of late years tea plantations are increasing in number and importance, no specific enumeration is yet made of tea lands in the revenue returns of the taxable lands of the empire. In like manner, by the general raising of a few shrubs for domestic use by families owning garden plots, a large portion of the fifty million pounds of tea annually consumed in this country might easily be grown on the spot without perceptibly interfering with present garden products or household industries.

The recent rapid extension of tea-growing in Japan, Java, British India, and elsewhere is evidence that there is nothing in Chinese soil, climate, or industrial conditions to secure to that country the monopoly of tea growing. In Japan tea is cultivated as far north as the 39th parallel, the most favorable region lying between the parallels of 30° and 35°, north latitude; while the cultivation is most successful between the 21st and 33d parallels, though the plant thrives almost anywhere up to the 45° north latitude. The Japanese crop has nearly trebled during the past twelve or fifteen years, and large areas of newly planted shrubs are rapidly coming into bearing.

Next in rank as a tea-producing country is Java. Since 1860 the industry has advanced so rapidly that the annual crop is now about half that of Japan. The plantations are most successful on the mountain slopes from three to five thousand feet above the sea; and the crop is said to pay better than coffee. Tea growing has also been begun lately in the British Straits Settlements with promising results.

The most rapid recent development of the industry, however, has occurred in British India, particularly in Assam. The first sample of Assam tea was sent to market in 1843; now there are upwards of 100,000 acres of tea plantations in Assam, yielding nineteen or twenty million pounds a year. In Bengal, Madras, the northwest provinces, and the Punjab, the industry is rapidly spreading and the prospect good. The crop of 1875–6 was estimated at 29,000,000 pounds—thus giving India the lead of Japan. The most of the India tea goes to England, where it is much liked.

In Ceylon also, tea culture has advanced very rapidly of late. In Brazil, it has been grown successfully in several provinces; but for home consumption Paraguay tea is preferred, and for export, coffee growing is more profitable. Tea growing is also advancing in Tonkin, Cochin China, Malacca, the Corea, and several of the islands of the Indian Ocean, formerly devoted to coffee; and efforts are making to introduce it into Australia and Jamaica. France, Spain, Portugal, Algeria, Italy, Turkey, and the Crimea, all have climates suitable for tea growing; and the same may be said of Tasmania, New Zealand, Mexico, and Central America.

THE CONGO RIVER.

Thanks to Stanley's pluck and energy, the well founded belief that Livingstone's Lualaba was no other than the Congo has now been fully justified; and henceforth the Congo must rank with the three or four great rivers of the globe. It is to Africa what the Amazon is to South America, the Mississippi to North America, the Yang-tse Kiang to Asia. It certainly exceeds the Nile in volume, and possibly also in area of drainage. Rising in the upland north of Lake Nyassa, it flows northerly through the great interior basin of Africa, until it reaches a point about the second degree of north latitude (long. 24° E.) when it swerves to the westward, then to the southwestward until it approaches the coast. Where Livingstone was stopped, the Lualaba was a noble stream from 2,000 to 6,000 yards wide; after making the great bend near the equator, it developes into a still broader stream, from two to ten miles wide, choked with islands. At the cataracts, where the river breaks through the coast mountains, the stream narrows to 500 yards or less: then spreads out into a broad stream from two to four miles wide with a current flowing about three miles an hour. The volume of water discharged is enormous; Captain Tuckey's estimate—2,000,000 cubic feet a minute—is probably not far from the truth. At its mouth the Congo is a thousand feet deep, and the water has been found to be perfectly fresh nine miles from the coast. For forty miles out the sea is perceptibly freshened by the vast volume of fresh water poured into it. The tide is felt as far as the first cataract, 140 miles up the river. In its lower course the river spreads out into extensive swamps covered with mangrove and palm trees.

The first successful explorer of the lower Congo was Captain Tuckey, who ascended the river to a considerable distance above the cataracts, when he was forced to turn back. His belief was that the Congo drained some large lakes north of the equator, and was a continuation of the Niger.

The next to reach the cataract was Captain Hunt, of the British steamer Alecto, in 1857. Six years later Captain Burton attained the same point. In 1872 Lieutenant Granby's expedition for the relief of Livingstone ascended still further, but was recalled in consequence of Livingstone's death. Cameron's failure to descend the river is fresh in the memory of all. He was forced to take a more southerly course to the coast by the opposition of the cannibal tribes, through

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whose territory Stanley's progress was a continuous battle. The German expedition under Captain Von Homeyer, which started in 1875 to explore the lower Congo to prepare the way for German colonization, will probably be heard from through Stanley, when details are received of his hazardous yet successful journey. One important point in connection with the future of the Congo is already apparent; Cameron's scheme for the development of the Great Interior Basin by means of steam navigation is likely to be long delayed. The great cataracts near the equator, not less than those near the coast, must ever present serious obstructions to the commercial development of the interior.

DOMESTIC WATER SUPPLY IN THE COUNTRY.

A great deal more difficulty is experienced in obtaining a proper supply of water in country houses than need be the case. The usual source is the cistern which receives the rain water from the roof. From this receptacle the water is pumped by hand to a tank in the garret, and the tank serves as a distributing reservoir whence the water is led by the pipes to the different apartments. Wells near the dwelling often replace the cisterns, but in any event there is the same labor to elevate the water so as to render it available where wanted. Where mechanical means are used, windmills seem to be favored, but these are open to several objections, the chief of which is their liability to become useless during the sultry windless days of a hot summer, and the fact that to compensate for the irregularity of the working a large reservoir is required for the water pumped in order that the supply may be constant.

Farmers will find that a small steam engine will serve their purpose in this particular much better than any other device. There are numerous excellently made and yet cheap engines in the market, especially suited to the work. Many are combined with their boilers so as to be portable; and if they are not already provided with pumps, these can easily be supplied in connection with them. Apart from the saving in time and muscle effected, the engine renders its owner independent of cistern or of any other single source of supply. It frequently happens that springs exist near houses, but on such low ground that the labor of pumping by hand is too great. Here the engine will prove a great help; and similarly if it becomes necessary to carry a pipe even over a considerable distance to get water, the engine is capable of doing the extra work. There are besides the incidental advantages of the extra safeguard secured against fire, and the obviation of the necessity of drawing water from sources near the house and perhaps, as is frequently the case, in too close proximity to the cesspool.

As for the skill required, any person possessed of an average share of common sense and the ability to manage a stove or cook cattle feed can run a little engine. It should have a trustworthy governor, and the boiler a free working safety valve. Then the operator has only to see that the bearings are kept oiled and the grate replenished. Many small engines are now made with interchangeable parts; so that if a portion gives out, it is as easy to replace it by sending to the manufacturer as it is to obtain a new part of a mower or reaper. Where the amount of water required in one house is not enough to make work for an engine, two or more neighbors might club together for its purchase, or some enterprising person might with one portable engine make a livelihood by going from house to house and pumping up supplies of water sufficient to last over a few days at a time.

NOTES OF PATENT OFFICE DECISIONS.

AMENDMENT OF MODELS.—Previous to taking an appeal to the Board of Examiners-in-Chief on the pertinency of the reference of rejection cited, Siebert made a preliminary motion before the Commissioner of Patents, to finally dispose of the question of alleged "new matter" which had been agitated at various times during the pendency of his application. He desired to amend the model belonging to the case so as to restore a missing element—a steam pipe—which it was admitted it originally contained, but which had been lost, and upon the basis of the model thus amended to correspondingly change both drawing and specification to agree therewith. So far there would have been no objection, but Siebert was desirous not only that the pipe should be restored, but that it should be placed upon the model in a particular manner, in a substantially upright vertical position with relation to the oil cylinder of the lubricator, to which it was connected. Were this the only position that would satisfy the spirit of the invention, there might perhaps have been no serious objection to this adjustment of the pipe; but as either a horizontal or a downward vertical position of the pipe would be equally in keeping with what was indicated as the *modus operandi* of the machine, a serious doubt arose as to whether the amendment could be allowed to go to the extent contended for, particularly as it would have resulted in the introduction of a new force or principle —hydraulic-column pressure-feed—in the working of the machine, which was nowhere indicated or hinted at in the original description.

The Commissioner holds that the right to cover, after discovered uses and results, is upon the assumption that the mechanism for which a patent is granted is invariable, so that there is permanency and certainty in the results accomplished. He therefore decides that the pipe may be restored, but not in a vertical upright position, and that the drawing must not show, or the specification describe, it in such relation.

SECOND EXTENSION OF THE VOELTER PATENT.—The Commissioner of Patents has granted a second extension of the Voelter patent for reducing wood to paper pulp. The original patent bore date August 29, 1857, was extended for seven years from August 29, 1870, and was reissued June 6, 1871. The act of Congress, approved March 3, 1877, authorizing this application for a second extension, directs that if "the Commissioner shall be satisfied that the said Henry Voelter, without neglect or fault on his part, has failed to obtain, from the use or sale of his invention or discovery, a reasonable remuneration for the time, ingenuity, and expense bestowed upon it, and the introduction of it into use, and that it is just and proper, having due regard to the public interest, that the term of the patent should be so extended, the said Commissioner shall extend the patent for the further term of seven years." In the early history of this patent great difficulty was experienced in introducing the wood pulp manufactured under it to the favorable attention of paper manufacturers. Indeed it was not until the year 1868 that Voelter began to realize anything from it. In that year, he sold his interest in the patent to Alberto Pagenstecher for a yearly payment of $6,000, during the life of the patent, including any extensions which might be granted.

From the evidence, it appears that the making of this contract by Voelter was, in view of all the circumstances, a reasonable and judicious disposition of his invention, warranted by his own circumstances and by the extraordinary amount of capital and enterprise required for the successful introduction of the invention against the prejudices of paper makers and consumers. Voelter received under his contract with Pagenstecher $12,285 profit, before the grant of the first extension, August 29, 1870. Of the $42,000 he should have received under the said contract, during the first extension of the patent, he surrendered about $10,000 of the amount as a voluntary contribution towards the very heavy litigation expenses to which the patent had been subjected. He also paid Mr. Prang, his agent in this matter for the New England States, a commission of twenty-five per cent of the amount collected from Pagenstecher, namely $10,500. His net receipts, therefore, during the first extension of the patent, were about $21,000. He testified that he received, for the same time, from his European patents for the same invention, not over $7,000, clear of his expenses. The assignee and licensees under him, interested in the further extension of the patent, had not realized, according to the evidence, more than five per cent upon their investments.

The Commissioner being satisfied that the inventor and those claiming under him had been unable, from many causes over which they had no control, and from no fault of their own, to realize such benefits as the object and spirit of the patent laws were intended to confer, grants a second extension of the patent for seven years.

SARGENT'S CASE.—The Secretary of the Interior has rendered his decision in the matter of the motion of James Sargent for the revocation of the order of the Commissioner suspending the issue of letters patent to him for an improvement in time locks, pending the equity suit against him by the Yale Lock Manufacturing Company, in the name of John Burge. Our readers have already been furnished through our columns with a detailed history of this case.

The Secretary of the Interior revokes the order of the Commissioner of Patents, and directs the latter to issue the patent to Mr. Sargent.

LOCOMOTIVE WHEEL SLIDING.

The sliding of locomotive wheels over the rails has generally been regarded as occurring only when the coefficient of friction of the wheels on the rail, or in other words, the adhesion, falls below the normal limit on which is based the calculation of the load to be drawn by the engine. M. Rabeuf, in a recent communication to the French Academy of Sciences, now states that he has investigated a series of facts which lead him to consider that sliding is a phenomenon much more general and more complex than is generally supposed.

On the 1st of May last, M. Rabeuf tested a new high speed engine for the French Northern Railway Company. The coupled driving wheels were 81·9 inches in diameter and the adhesive weight carried by these wheels was about 59,400 pounds. The weather was fine and dry. The grade of the track was ·005 to 1. Throttle wide open and boiler pressure 124 lbs. per square inch. Under these conditions the engine descended the grade, and having no load to drag attained a speed of 62 miles per hour. This should correspond with a velocity of the coupled wheels, says M. Rabeuf, of 303 turns per minute. Now the actual rotation was 360 turns in the same period. They slid therefore on the track, and hence the velocity of translation should have been over 75 miles per hour. The relative sliding amounted $\frac{88}{720}$ to 0·16.

Astonished at this result, M. Rabeuf repeated the same observations on several engines of different types, comparing their actual velocity of translation over the road with the velocity of rotation of the driving wheels. He found that the sliding or skating was almost nothing on an up grade, but very notable on a down grade. It augments rapidly with the speed, and on descending slopes varies between 13 and 25 per cent. It averages therefore 20 per cent, so that its suppression if possible would result in considerable economy in consumption of fuel and wear of rails and tyres. M. Rabeuf assigns no cause for the phenomenon.

TAX COLLECTION BY MACHINERY.

The State of Virginia has adopted a machine to make barkeepers and liquor sellers honest and to prevent their evading the revenue tax on liquor sold at retail. The apparatus which now must by law decorate every Virginian bar is simply a registering dial combined with mechanism which whenever the index is moved ahead sounds a bell. The dial indicates up to a million drinks. Tampering with it is prevented by the peculiar seal, which consists of a miniature tongue of brass that perforates a bit of paper carefully fitted into the lock. After this tongue is in place, the paper bears only a single perforation. Any attempt to violate the seal will result in defacing and tearing the paper, and this will be sufficient to subject the saloon keeper to prosecution under the law.

Two results have followed the introduction of the invention, which might easily have been anticipated. The first is that the liquor men have raised the price of their beverages so as to cover the amount which they are now obliged to pay in taxes, and the second is the production of devices to swindle the machine. Already one enterprising individual has begun using a bell behind his counter having precisely the same sound of the gong in the machine. He went through all the motions of operating the latter, and the false bell sounding made it seem as if the drink had been properly registered.

The Fair of the American Institute.

The 45th annual Fair of the American Institute opened in the usual Exhibition Building on the corner of 63d street and 3d avenue, in this city, on the 12th ultimo. The show bids fair to be an excellent one. In the Main Hall there is now a better display than we can remember ever to have seen at so early a date during the progress of previous exhibitions. On the other hand the machinery department is in a state of backwardness, even worse than usual, and in marked contrast with the rest of the display. Some of the energy manifested in the general portion of the show might profitably be turned toward advancing this department. We shall make our usual notes on the novelties exhibited when the preparatory proceedings are finished.

Chlorhydrine in Tanning.

In what is known as white tanning, and in tanning glove leather and kid especially, a paste is employed which contains wheat flour, yolk of eggs, alum, salt, etc. Knapp had shown that the action of the egg yolk was chiefly due to the finely divided oil contained in it. Many attempts have therefore been made to employ some other oil, in an equally fine state of division, but without success. C. Sadlon now proposes to make an oil emulsion with the aid of chlorhydrine. He claims that in his experiments the skins take up this tanning material rapidly and perfectly, and the leather is as beautiful as when eggs are used.

The preparation of chlorhydrine ($C_3H_7ClO_2$) by the method in use, namely, by acting upon glycerin with hydrochloric acid gas at 212° F., is too difficult and expensive for this substitute to be profitably employed at present. But as the materials are not dear or rare, any considerable demand for chlorhydrine would, no doubt, be followed by an abundant supply at a reasonable price. Further experiments are, however, required to determine whether the process is practicable on a large scale.—*Gerber.*

Analysis of Insulating Glass.

It is well known to physicists that glass differs greatly in regards to the resistance it offers to the passage of electricity. A bell glass made for a Thomson electrometer possessed such an unusual insulating power that, when it happened to be broken, Primke took the trouble to analyze it. The percentage of all but soda in it, he says, agrees with that in a sample of optical glass analyzed by Berthier. The results were as follows:

	Bell glass.	Optical glass.
Silica	58·450	59·2
Potassa	9·236	9·0
Soda	3·745	——
Lead	28·019	28·2
Lime	0·064	——
Magnesia	0·054	——
Sesquioxide of iron	0·474	0·4
Oxide of manganese	——	1·0
	100·042	97·8

Omitting the impurities, we have silica 58·77, potassa 9·28, soda 3·77, oxide of lead 28·18. Such a glass could be obtained from the following materials:

Rock crystal pulverized	10,000
Pure potassa from alcohol	1,880
Pure caustic soda	830
Pure red lead	4,840
Arsenious acid	18

Hints about Glue.

Good glue should be a light-brown color, semi-transparent, and free from waves or cloudy lines. Glue loses much of its strength by frequent re-melting: therefore, glue which is newly made is preferable to that which has been re-boiled. The hotter the glue the more force it will exert in keeping the joined parts glued together. In all large and long joints it should be applied immediately after boiling. Apply pressure until it is set or hardened.

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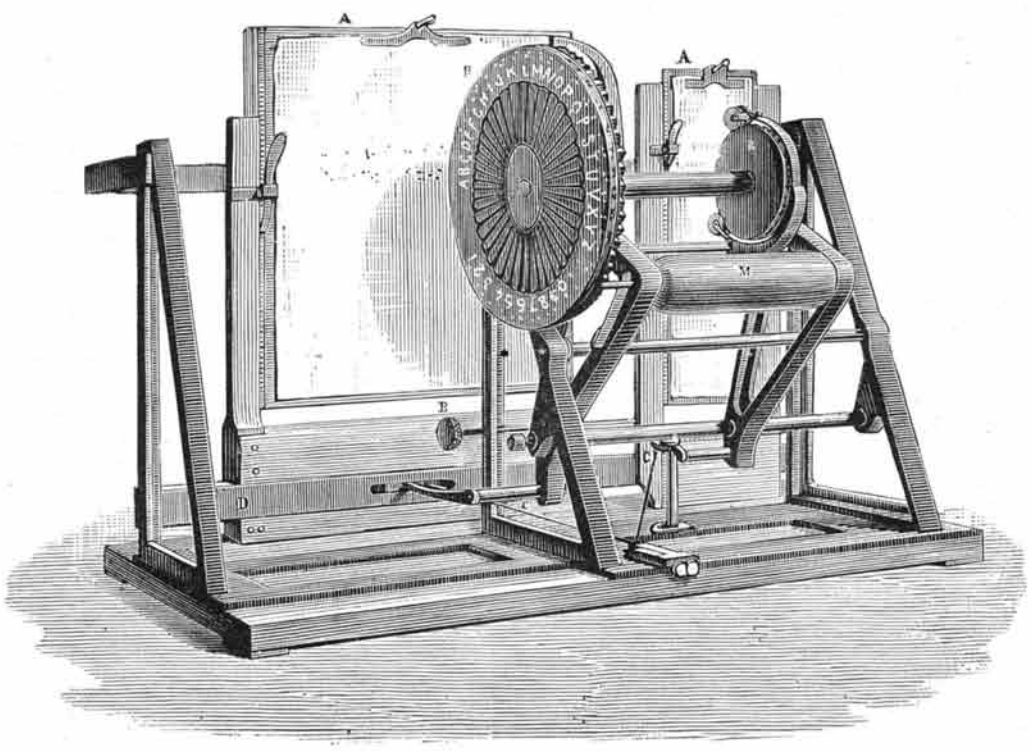
THE DIPLOGRAPH.

Mr. Ernest Recordon, of Geneva, Switzerland, has recently invented an ingenious writing apparatus for the blind, to which he has given the above name. As shown in the accompanying engraving, for which we are indebted to *La Nature*, it consists of two disks, R and R′, turning on the same shaft. The first has on its periphery the alphabet for the blind, the letters being formed of combinations of dots (in this case raised points), and the other carries the ordinary alphabet in raised type. Besides the dot alphabet on the periphery of disk, R, a similar alphabet is made around its left face. Two sheets of paper, A, and A′, are extended in front of the edge of each disk.



THE DIPLOGRAPH.

A blind person using the apparatus proceeds as follows: With the fingers of his left hand he feels along the alphabet on the face of disk, R, until he recognizes the letter which he desires to imprint. He then turns the disk until that letter comes just beneath a pointer placed above the wheel. The corresponding letter on the edge of the disk being situated just 90° from the similar letter on the face, it follows that, when the last mentioned letter is at the upper extremity of the perpendicular diameter of the disk, the first letter is at the extremity of the horizontal diameter, or, in other words, comes directly in front of the paper. The handle, M, is then pushed forward and the disk is thereby carried against the paper, causing the raised points forming the letter to leave their impress thereon. In contact with the type on the periphery of disk, R′, are two inking rollers, and said disk is placed exactly corresponding to disk, R, so that, when a given letter on the latter is brought in face of the paper, the same character on disk, R′, is similarly placed. Hence, on one sheet of paper a letter in dots, legible to the blind person, is pricked, while on the other sheet an ordinary printed letter is impressed. After each forward movement of the disks, a simple mechanical device moves the paper support slightly to the left, so that the successive letters are thus impressed in their regular order.

The entire apparatus is exceedingly simple, and *La Nature* states that the first time it was placed in the hands of a blind person he comprehended it at once and operated it without difficulty. It enables the blind to write whatever is desired in duplicate. One copy they can read themselves by the fingers and so may verify their writing, while the other copy is legible to people having the use of their eyes. The device affords a means of two blind persons maintaining a correspondence or of writing to the blind, by persons not conversant with the raised alphabet, in which last case the necessary adjustments are made on the type wheel.

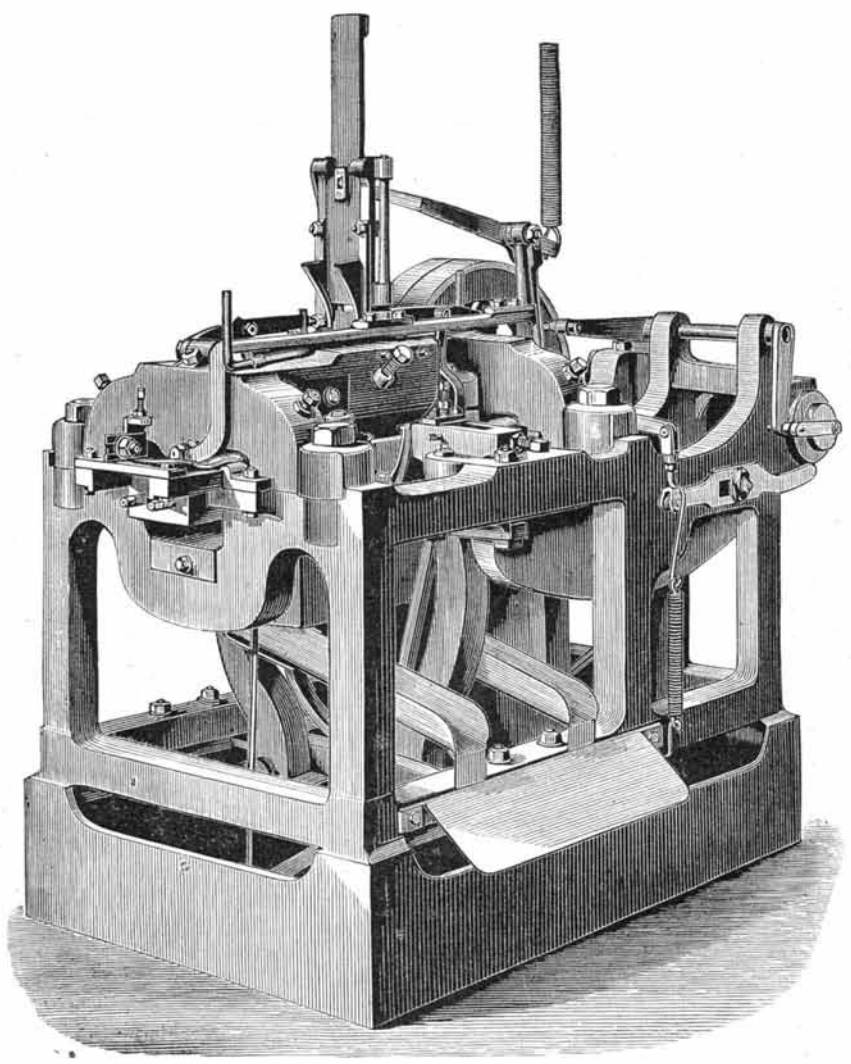
IMPROVED NAIL FORGING MACHINE.

We illustrate herewith a machine constructed by Messrs. Taylor and Challen, of Birmingham, England for producing from strip iron, nails similar to hand-made, at rates varying from two to three hundred per minute, and lengths of from 6 inches to 1 inch, two nails being completed at each revolution of the driving shaft of the machine. The framing consists chiefly of a main casting, to which are fixed an upper frame, carriages for the driving shaft, and other details. The principal moving part is a heavy steel slide, deriving its motion from a crank pin with adjustable throw; this slide carries two shears, two gripping dies, and sundry indispensable appendages, to some of which it imparts motions for guiding the nails between the stages of cutting off and finishing.

The successive operations by which each nail is perfected are as follows: A piece of iron about 6 inches long, and of a width and thickness somewhat greater than the length and thickness respectively of the finished nail, is inserted at a red heat to the feeder of the machine; a narrow strip is immediately cut off the lower side of the heated iron, and by the motion of the steel slide is carried to and pressed against a fixed die; while in this position another die rises at right angles, and presses the partially formed nail against another fixed die. Thus the headless nail is firmly held on its four sides, and while in this position a lever, moved by a cam, and carrying a suitable tool, advances and forms the head, thus completing the nail. The return motion of the steel slide releases the nail, leaving it free to fall, but as its weight is not sufficient to insure this happening, a "knocker off" is provided, which at the right moment forcibly ejects the nail by way of a guiding shoot into a receptacle placed outside the machine.

It is to be noted that the tools for shearing and gripping, and which have to be changed with each different size of nail, are made of a special mixture of cast iron. They are thus easy of preparation and renewal, while at the same time answering their intended purpose as well as or better than the finest cast steel at less than half the cost.

The whole of the machine is carried upon an open top cast iron water tank, serving as a receptacle for the tongs and tools heated in withdrawing the iron from the furnace. Several of these machines, says *Engineering*, in which we find the above, are now successfully at work.



NAIL FORGING MACHINE.

A Mining Tunnel Thirty-one Miles Long.

After thirty-three years of uninterrupted labor the great undertaking of the Rothschonberger water adit is so far completed as to admit of its use. The method of draining the Freiberg mines, Saxony, by means of a deep tunnel, had already been discussed in the beginning of the present century, as a question of necessity for the future mining prosperity of the vicinity; and undoubtedly the Rothschonberger tunnel is the greatest work of the kind that has ever been undertaken to aid the exploration of a mining district. Other great adits, such as those of the Hartz mountains and the famous Sutro tunnel, fade when compared with a tunnel which has already attained a length of more than 26 English miles, and will be with its branches, when completed, more than 31½ miles. The plan was to conduct the water from the Freiberg mines to the nearest practicable point on the River Elbe. Rothschonberg, 12 kilometers above Meissen, was chosen as the most advantageous place for the mouth, on account of its having the lowest level at the shortest distance from Freiberg. The preliminary surveys were made in 1843, but the work was not thoroughly taken in hand until the third quarter of the year 1844. Since that time the driving of the tunnel has been unceasingly carried forward, but coupled with many hindrances and difficulties, such as quicksands, immense quantities of water, etc., which have trebled the cost and retarded its completion.

The tunnel is ventilated by eight air shafts, and lies some 400 feet below the deepest Freiberger water adit. It has a uniform height of 9.84 feet, with a somewhat smaller breadth. The present length of the adit with its ramifications is 43,000 meters (all of which length is now in use), and will be when completed over 51,000 meters, or 31⅔ miles. The cost of the tunnel is estimated at 12,000,000 marks or $4,000,000, and will be paid for by a tax on all the mines which it directly benefits. The gradient of the floor is only 0·03m. in 100 meters. This small gradient may make it necessary to clear the tunnel occasionally, but this can be accomplished without difficulty with suitable boats and dredges. Five miles of this tunnel are perfectly straight, without the slightest curve, and along the whole length the curves are very light. One rather interesting occurrence during the past year was the striking of an old mine, of which no maps are in existence. The mine is probably more than four centuries old, and the timber which had been used as supports, etc., was found for the most part sound. Two new veins were also struck, but only one of them will be exploited. It is rather remarkable that nearly the whole driving of the tunnel has been done by hand, Burleigh drills, driven by compressed air, having been introduced within the past year. The rock throughout nearly the entire length is solid gneiss, which accounts for the great time that has been taken to the work, it being necessary, with hand boring, to put in as many as from 40 to 50 holes to the face.

The necessity for the continued prosperity of the Freiberg mines, which have now been worked for about seven centuries, may be gathered from the fact that at the present time there are more than 6,000 laborers, with their families, amounting altogether to some 20,000 persons, who derive sustenance from the mines and metallurgical works connected with them. It may reasonably be expected that the Rothschonberger tunnel will give fresh impetus to the Freiberg mining, and considerably augment the output of ore, which has of late years somewhat fallen off, owing to the immense quantities of water which continued to flood the mines, and prevented the veins of ore being followed and worked below a certain depth.

Saxony may well and justly be proud of a tunnel which is without doubt the longest in the world, and which has required so much time, perseverance, skill and labor as the Rothschonberger water adit.

A New White Paint.

Native barytes, or barium sulphate, is mixed with pulverized stone coal and tar, and exposed to an intense heat, so as to convert it into barium sulphide. The latter being soluble can be dissolved out, and to the clear solution is added a corresponding quantity of zinc chloride in solution, when zinc sulphide will be precipitated while barium chloride remains in solution. To the solution of barium chloride is added white vitriol (zinc sulphate), when a precipitate of barium sulphate will be formed and zinc chloride left in solution, which latter can be filtered and again employed to precipitate the barium sulphide.

The two precipitates obtained as above, namely, zinc sulphide and barium sulphate, are well washed, mixed, dried, heated to a cherry red, then thrown into cold water, and finally ground in water and dried. The white pigment thus obtained covers well, and is well suited to mix with oil, as a substitute for lead, especially where sulphur compounds exist or may be generated.

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Gold Crystals from the Ural.

Helmbacker describes, in a recent number of the *Mineralogische Mittheilungen*, an interesting collection of crystals of gold brought by Tunner from the washings of Inzelokylog near Sysertsk in the Ural. Some of these crystals were pure golden yellow, while others had a brownish color almost like bronze. As the specific gravity of both kinds of gold was found to be the same, the cause of the color cannot be attributed to difference in the substance, but rather to a thin coating of simonite which caused the bronze yellow color. From the density the percentage of gold was found by the Archimedean rule of alligation to be about 77 per cent.

A New Fluorescent Dyestuff.

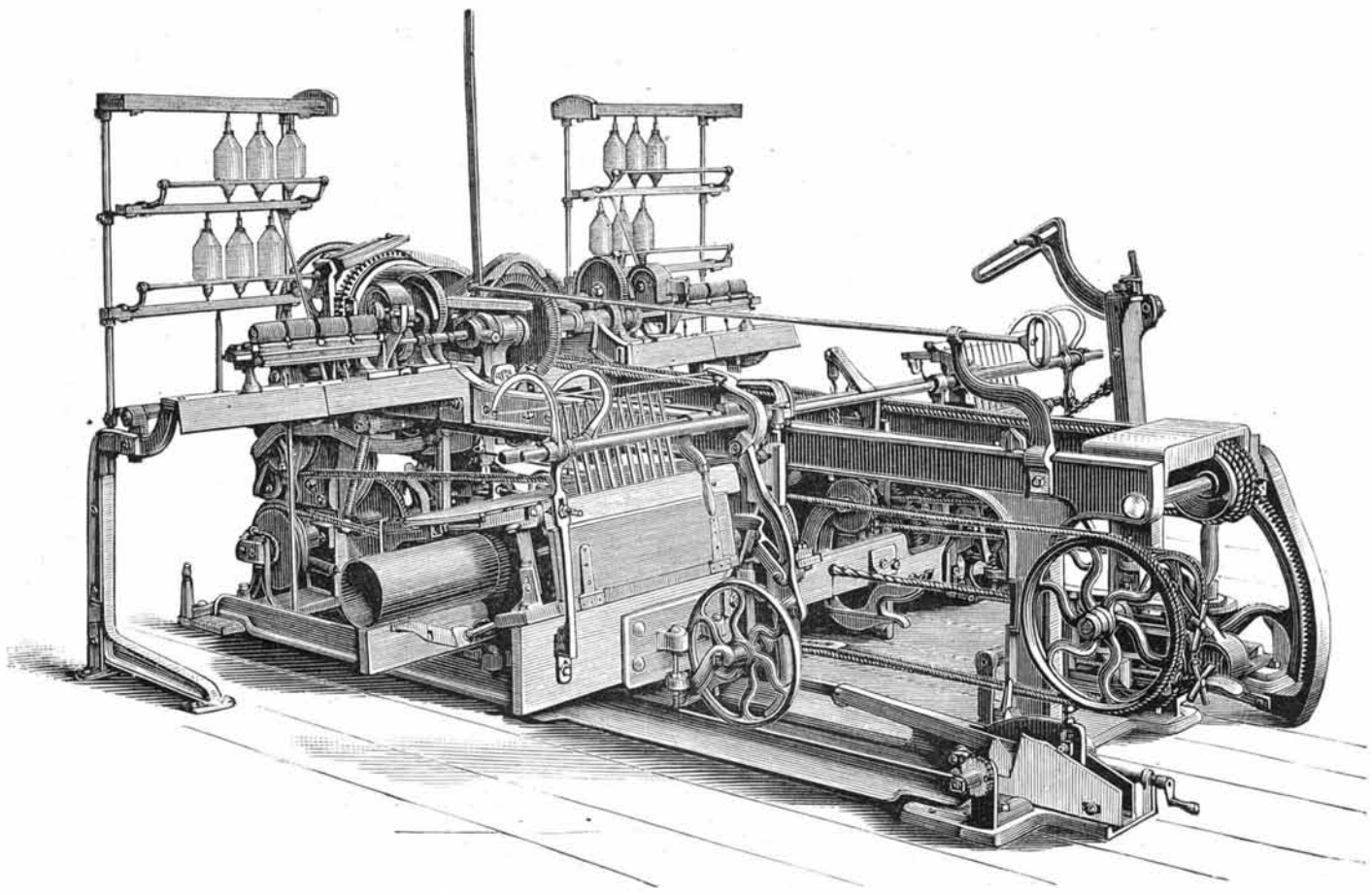
A Zurich chemist has obtained a new fluorescent dye by acting upon resorcin with oxalic and sulphuric acids. It dissolves readily in alkali, and dyes silk, as well as mordanted wool, red. It resembles eosin in chemical properties. Treated with an excess of fuming sulphuric acid, it dissolves with an orange yellow color, which gradually turns to green blue, green, and finally a beautiful blue. When heated to 212° F. it changes to a purple red. When supersaturated with dilute caustic soda, the solution turns a beautiful carmine red, and exhibits magnificent fluorescence.

IMPROVED MULE HEAD STOCKS.

We reproduce from *The Textile Manufacturer* cuts and description of an improved mule head stock, manufactured by Messrs. Asa Lees & Co., of Oldham, England.

The head stock of this mule stands on strong iron foun dation plates, and, mounted on these plates, parallel with the frame of the head stock, run two main slips, upon which is supported a self-contained square, firmly tied together in every part. And upon planed beds, on this square, are fixed the whole of the brackets, etc., so that not a single article is bolted to the woodwork. This arrangement conduces greatly to the stability of the setting, and the accurate working of the parts contained in the square, as no giving way is possible through the shrinking of the woodwork. The rim band guide pulleys are 11½ inches diameter, and run in double journals. The cop governing motion is entirely self-acting, making a cop bottom without the aid of the minder; and being actuated by the fallers, is purely automatic, only giving chain when required, thus producing a bottom, hard, evenly wound, and entirely free from snarls. The backing-off motion performs the delicate operation throughout the building of the cop, without any hooking up of the chain by the minder, the chain being of uniform tension through out the whole time. This motion is obtained by means of a cam, introduced to work along with the ordinary backing-off pulley, and which is made to correspond to the variable cells of yarn upon the spindle—a work of great nicety—and when in action it brings the faller wire down, in the same ratio as the yarn is unwound from the spindle, thus avoiding, in one case, the fracture of the ends by the wire descending too fast; and in the other preventing snarls by its too slow depression.

By an ingenious arrangement of levers, whereby a correlative action is obtained, no two motions can be in gear at the same time. The act of putting the taking-in motion in gear must first disengage the drawing-out motion, and if the latter is put in gear it will throw out the taking-in motion first. The carriage is also forced to come out on the retaining catch, and to back off before the winding can com mence. The drag wheels are so arranged that one tooth is equal to half an inch of yarn. This mule is also supplied with a patent full copstopping motion, which will stop the mule when the spindles have received a speci fied number of draws. By this means every set of yarn doffed may be made to contain the same length of yarn, and by a careful and accurate method of weighing it would be easy at any time to ascertain the counts of the yarn of each set delivered from the mule. The copping arrangement stands on the foundation plates, and is supported on double shaped plates, back and front; the rail being supplied with self-adjusting loose incline, which insures regularity of faller locking

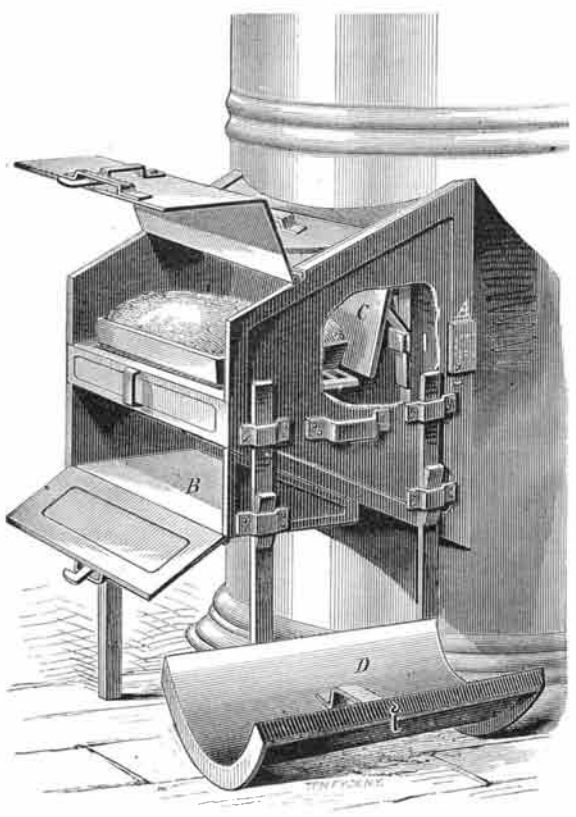


LEES & CO.'S MULE HEAD STOCKS.

DREW'S IMPROVED BAKER.

The invention herewith illustrated is an improved baking attachment for stoves of all kinds, so that the heat of the latter may thus be utilized for cooking purposes. It may be adjusted to stoves of any shape.

The construction of the device is plainly shown in the engraving. The side walls are extended beyond the segmentally recessed and inclosed top and bottom walls. Slides are also provided above and below, which are moved forward or backward in suitable guides. The side walls may



be notched to fit the rim of a stove, the notches otherwise being closed by pivoted pieces as at A. The baker is supported on adjustable front and hind legs, so that it may be placed at any height to suit different stoves. The legs slide in guide bands and are secured by wedges or clamp screws.

A warmer, B, is arranged below the bottom of the baker, and serves for heating plates, etc. The baker is provided with a hinged door as shown and also with a grate or shelf for holding the articles to be cooked. On these last the heat from the stove is deflected by the inclined top of the compartment. In order to prevent the heat cooking the side of the object nearest the stove first, a deflector plate, C, is provided. To graduate the temperature in the oven, the entire apparatus is simply moved a little away from the stove. This precludes the necessity of opening the doors. When baking is not going on, the front part of the device is closed by the detachable cover, D, which retains the warmth and protects the contents of the baker from dust, etc.

Patented September 4, 1877, through the Scientific American Patent Agency. For further information address the inventor, Mr. Luna Drew, Irving, Jackson county, Wis.

Inventions before the Admiralty.

Inventors who submit devices to the English Admiralty now receive a circular to the effect that if they expect remuneration a specific claim for it must be made in the letter of submission. If the device is found worthy, a committee recommends it to the Lords of the Admiralty; an award is fixed which, if the Treasury concur, is included in the estimates and submitted to the House of Commons. If this body votes the inventor his money, then he gets it, in due course of official delay.

Composition and Purification of the Paris Sewage.

Ch. Lauth has been studying the sewage water of Paris taken from the pump at the Alma bridge and from the collecting basin at Pepinière. He found that this liquid varies in composition from hour to hour as well as day to day. In February, 1877, it contained on an average 1,242 grammes of suspended matter and 682 grammes of dissolved matter in a cubic meter. It contained 35 grammes of nitrogen and 660 grammes of organic substance; of the nitrogen only 6·88 grammes were in the form of ammonia and 1·9 grammes as nitric acid. The water when fresh from the sewer was turbid and slightly colored, but perfectly odorless. When corked up in a bottle without being filtered, it began to change in a few days, and, after 10 to 20 days, was in complete putrifaction. If the water was filtered first, it would keep two months without developing any odor.

If air was caused to bubble through this liquid its properties and composition were quickly changed; the water after saturation with air is no longer capable of becoming putrid. This was proved by filling two bottles, one with ordinary sewer water and the other with water that had been aired; in 10 to 20 days the first was black and putrifying, the second was clear and odorless for two months. The chemical examination and comparison of the two samples showed that, in consequence of the air being blown through, the nitrogen of the insoluble part had decreased, while the nitrogen in the soluble portion had increased to the same extent; no nitrates had been formed, but the quantity of ammonia had increased considerably. The quantity of insoluble nitrogen was also reduced by treatment with lime; the ammonia increased from 5·282 grammes to 18·550 grammes, and the water remained odorless and colorless at the end of two months.

A microscopical examination of the fresh sewer water discovered movable and immovable bacteria, vibriones, and some monads upon the surface of the liquid; on the bottom of the vessel were fragments and refuse of all kinds, without any trace of living beings. After two days there is on the surface a skin of bacteria with knots below; the monads had increased very much and kolopods began to make their appearance.

On the fourth day vorticelli appear, together with large fringed infusoria; at the same time algæ of various forms are seen. On the seventh day the water, which was previously odorless, began to smell badly and turn black; it was covered with a thick skin, which seemed to contain unicapsular infusaria: numerous remains and fragments of dead, black algæ were seen. At the end of 4 or 5 weeks the odor is stinking; almost every trace of life has disappeared.

Water treated with lime was free from all vegetable and animal life. In sewage water that has had air blown into it life is very active; the algæ and infusoria develope in large numbers, then disappear slowly in the course of a few weeks, but no bad odor is ever perceptible, and the water remains clear.

These facts prove that the sulphuretted hydrogen putrifaction of sewage can be prevented by the addition of lime. —*Comp. Rend.*, LXXXIV, 617.

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[*Continued from first page.*]

current is generated in the coil wire. Now if, to the binding screws, wires be attached, communicating in like manner with an apparatus precisely similar to that described, it will be clear that there will be a closed circuit of wire, and our induced current will pass through the second telephone and back again to the first one. But in passing through the coil in telephone No. 2, it modifies the magnetization of the magnet and increases or diminishes its attraction for the diaphragm. Hence every vibration made by the first disk is repeated by the second one, and whatever sound produces the vibration of one is transmitted to and reproduced by the other.

Our large engraving, Fig. 2, affords an excellent idea of how the instrument is used, and also of about the extent of circuit over which it is known to be capable of successful operation. We suppose the closed wire circuit to extend from New York to Newark, thence to Paterson and Yonkers, and back to New York, a distance of about 50 miles air line, or some 70 miles by railway. The figure marked New York may be considered as a public speaker delivering a lecture to be heard in the towns mentioned. He talks into one telephone while he holds another to his ear, in order, for example, to hear the applause, etc., of his auditory; or he may be maintaining a discussion or debate, and he then hears his adversary's replies or interruptions. Now, at Newark there is simply a reporter, who takes down the speech phonographically; the words pass on through that telephone and reach Paterson. Here we show two persons, each with a telephone, the two instruments being connected. Each hears from his own instrument. Perhaps, in the future, operatic or concert companies and lecturers, instead of traveling over the country, will simply send out telephones enough to present each person of their audience in a distant city with an instrument apiece, and do their talking and singing once for all in the metropolis. In Yonkers we show three persons listening to a single instrument, which may be done in a very quiet room. Finally, in a side sketch we show how the telephone is arranged to serve as a speaking trumpet between office and shop in a factory. Of course for a long circuit there would be earth connections instead of the wire loop.

The telephone has advanced considerably beyond the status of a "beautiful scientific toy," which many hastily pronounced it, and is now in constant use in numerous private lines in New York, Boston, and Providence. Professor Bell recently exhibited it before the British Association at Plymouth, England, where it attracted great attention. It is at present manufactured by the Telephone Company, of New York, Mr. Charles A. Cheever, Manager, 32 Tribune Building, this city.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The Sargent case, of which you gave a detailed account in No. 12 of the current volume, was decided by the Secretary of the Interior in favor of the applicant, on the 13th inst. The grounds of his decision in brief are as follows: The Commissioner of Patents' duties are defined by the statutes and must be exercised in accordance therewith, and with such rules and regulations as may, with the approval of the Secretary of the Interior, be adopted to facilitate the business of the bureau. Letters patent are not to issue until the right thereto has been clearly established in accordance with the law and rules of the Office; but when this is done, and all the requirements of the law and rules have been fully complied with, they cannot be withheld. Section 4893 states that the Commissioner "shall issue a patent" after the applicant is adjudged to be entitled to it. The words "may issue," in Section 4,904, should be read "shall issue," as the Supreme Court, in the case of Mason *vs.* Pearson, 9 Howard, 260, decided that, "Whenever it is provided that a corporation or officer 'may act' * * * * it may be insisted on as a duty for them to act, if the matter devolves on a public officer and relates to the public or third persons." No appeal lies to any other tribunal from a decision of the Commissioner in an interference case, and his decision is therefore final. The proceeding in the Court of Equity is a proceeding *de novo*, and is in no sense an appeal from the Commissioner's decision; it cannot, therefore, justify the withholding of a patent. Nor can the withholding be justified by what is termed the discretionary power, in view of the statute which says that the patent "shall issue," because the Commissioner should not doubt the correctness of the conclusions arrived at by his Office.

The Secretary states that he has no doubt that he is charged with the duty of seeing that the Commissioner of Patents properly performs his duties, and that he has therefore the power to direct the Commissioner to issue the patent. As, notwithstanding the bill in equity filed by Mr. Sargent's opponents, the Secretary can see no reason why the patent should not be issued, he, after acknowledging that he believed the case to have been judged by the Commissioner in a spirit of absolute fairness, directs him to prepare for issue the patent to Mr. Sargent.

When it was announced what the decision of the Secretary of the Interior would be, the attorneys of the Yale Lock Manufacturing Company, in the name of John Burge, made a motion to the Equity Court of the District of Columbia, for an injunction and an order restraining Sargent from taking out his patent until the hearing of said motion, which restraining order the court granted. The motion for injunction coming on to a hearing, Chief Justice Carter of the Supreme Court, holding Equity Court, made a decree on the 19th inst., denying the injunction and dissolving the restraining order, on the ground mainly that he could not see any good reason for granting the injunction; that the reasons for and against just about balanced each other; but that as the party who had asked this injunction had not so far established his rights before another and independent—independent so far as the present proceedings were concerned—tribunal, he, as the judge of another tribunal, had no power over the Secretary of the Interior or Commissioner of Patents. The only power the District Court had in such cases was, where an inventor was dissatisfied with the rejection of his application, he could appeal to the Court and have its judgment upon his rights. But this bill in equity was an independent proceeding between the parties, and therefore occupies a totally different position from an appeal to the Court by an applicant whose case had been rejected. It is believed the patent will now be issued, and will bear date September 25, 1877.

The next move, judging from the remarks of the Yale Company's counsel to the court, will probably be the asking of an order restraining Mr. Sargent from exercising any rights he may have acquired by the issue of the patent.

The application of the owners of the patent on the Fountain register, for a preliminary injunction against the manufacture of the so-called "Moffett Liquor Punch," has been heard by Judge Hughes of the United States Circuit Court, at Alexandria, who overruled the motion and dissolved the temporary restraining order granted on the 8th of August last. The judge in giving his decision claimed that the action of the Patent Office, in granting a patent on the Moffett register, made a *prima facie* case in favor of the defendant, and that the difference in the construction of the two instruments and the purposes for which they were intended warranted the court in overruling the motion for a preliminary injunction. As the difference of construction was mainly in the substitution of a pinion for an endless screw, and the purpose in one case was to register fares and in the other to register drinks, these variations do not seem to amount to much. As, however, the matter is to come up again for a final hearing on the 17th of October, the judge required the defendant to give bonds for $20,000, and to give account of the number of machines manufactured and the receipts from their sale. In the meantime the Moffett registers have been placed in most of the bar-rooms throughout the "Old Dominion," each bar-keeper being required to keep account by it of all drinks sold, and to pay into the treasury of the State two and a half cents on each glass of alcoholic liquor sold, and a half cent on each drink of malt liquor. This has caused, it is said, the raising of the price of liquor from ten to fifteen cents per glass, and great is the outcry thereat. The register is a machine about the size of a small cigar box, with a dial in front and a crank in the rear, which the bar-keeper, every time he dispenses a drink, turns once, thereby operating the register and striking a gong. The title usually given it is really a misnomer, as there is no "punch" connected with it, excepting that kind which the machine is intended to register, and such as result from their too free use.

The Secretary of the Legation at Paris has forwarded to the State Department a copy of the circular issued by the directory of the Exposition and sent to the commissioners of foreign countries, urging them to prompt action. The circular states that the essential parts of the buildings will be completed and the floor laid by the beginning of October after which each commission can take possession of and parcel out its section.

Our Consul at Antwerp, in noting the absence from the agricultural fair recently held there of American manufactures, informs the Department of State in a recent report that there can be no doubt about the superiority of our agricultural machines and implements over those shown there, and that our manufactures, by patience and perseverance in their introduction, could overcome the conservatism and prejudice of the Flemish peasants and farmers, thereby building up a large trade in Belgium; and that what holds good there is equally applicable to all other European countries.

From our Consul at Liverpool, the Department has received a report stating that from ten to twelve thousand operatives, in the cotton mills at Bolton and vicinity, have struck rather than submit to a reduction of five per cent on their wages, and that 106 mills have closed in consequence. He states that the men are reported to be in good financial condition to sustain the strike, and that large contributions will be supplied by other associations. The same operatives struck against a similar reduction in 1874, but submitted to an arbitration, which was decided against them. The five per cent, however, was restored in 1875, and the present strike is occasioned by another attempt to take it off. Unless arbitrators are again called in, the present strike will probably prove a stubborn one, for while the men assert their ability to remain out an indefinite time, the mill owners, on account of continually decreasing American markets, the famine in India, and the Eastern war, are said to be well pleased to have their places closed.

The Secretary of State has notified the United States Ministers to Brazil and the Argentine Republic that the Navy Department has determined upon sending out the United States vessel Guard to connect the longitudes between Lisbon, the coast of Brazil, etc., and directing the ministers to report this to the governments to which they are respectively accredited, with a view of having these governments afford such assistance to the officers of the vessel as they may be able.

The Treasury Department lately advertised for bids for the purchase of the paper pulp resulting from the destruction by maceration of government securities, bank notes, etc., of which it is believed there are upwards of six hundred tons, and awarded it to a Philadelphian who bid $8.53 per ton, which is $3.50 per ton more than the department has heretofore received for similar material.

The Post Office Department is in receipt of thousands of plans from all sections of the country, for cancelling or mutilating postage stamps after they have been once used, in such a manner as to render it impossible for any one to use them a second time. Most of these plans are for methods that were long since proved impracticable either from the time consumed in cancelling, from the destroying of the letter as well as the stamp, or from some other equally difficult cause to remove. From the immense number of this class of letters, the department finds it cannot reply as promptly as the senders wish to this class of correspondents.

The Department of Agriculture reports that the condition of cotton averages for the whole cotton belt about the same as last year. Florida, Alabama, Mississippi, Louisiana, Arkansas, and Tennessee make higher averages than in 1876. The Carolinas, Georgia, and Texas report lower—the greatest reduction being in Texas. The caterpillar is present in all the Gulf States and in South Carolina, but has done little damage yet except in Texas. In several parishes in Louisiana the loss is considerable from this cause.

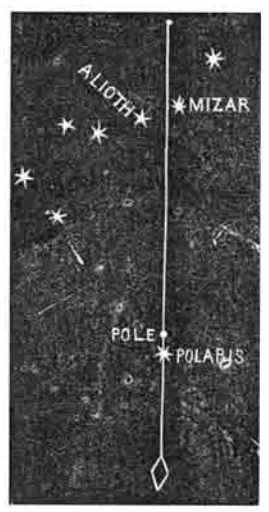
Washington, D. C. OCCASIONAL.

How to Establish a Meridian Line.

To the Editor of the Scientific American:

It may be interesting to many of your readers to know how to establish a meridian line and what is called a noon mark. It is not only convenient where correct local time is not easily obtained, but it is very essential in different localities to determine the magnetic variation for the purpose of surveying. Owing to magnetic ores in the ground, the compass needle does not always point toward the magnetic pole. To detect the local variations a meridian line is necessary, which is so very easy to establish that no town should be without it. There are two methods, one with an engineer's transit or theodolite, the other is by alignment, which requires nothing more than three or four sticks, a plumb line, and two candles. The former method is capable of giving the most accurate results when the instruments and manipulations are all right. The latter, however, being accurate enough for most purposes, we will describe it. The stars to be observed are Polaris (the north star) and Mizar (the middle star in the handle of the Dipper). Polaris comes to the meridian five minutes in time before Mizar. These stars coming to the meridian so near the same time one above the other below the pole, we can use them to ascertain the true position of the pole of the earth.

For temporary work, a stake driven in the ground will answer, but for permanent purposes stone posts or mason work placed below the frost is advisable. Two hundred feet is a very convenient distance; less may be used for a compass and very much more for instruments with telescope. At the southern end of the location drive a stake or erect the pier having two lines cut on the top crossing each other at right angles, then set up three sticks six or seven feet in length, in the form of a triangle, with the apex over the cross, let drop a plumbline from the top to the center of the cross; this line should be white, and illuminated on the south side by placing a light a little above the head of the observer, who may sit sideways or astride of a chair, the back of which being toward the line serves as a support for his head, which requires to be in a fixed position. Place a light in a perpendicular with Polaris, at the required distance from the southern station; this gives the approximate position for the northern post or pier. After this pier is in position the true northern point is found by taking a lighted piece of candle, having the wick central, and placing it perpendicular on the top of the pier, and adjusting it so that Polaris and the light shall be bisected by the plumbline at the southern station, five minutes before Mizar reaches the line, or twenty-five after Alioth (the first star in the handle) has passed it, then draw a line around the base of the candle, the center of which is the point required.



If several observations are carefully made when Mizar is both above and below the pole, and the mean taken, there will be but little or no error. As Polaris has a much larger annual variation than Mizar, in 1892 they will be exactly opposite.

To establish a noon mark from this meridian line all that is required is to attach to the upper part of the plumbline some object large enough to make a shadow, then when the

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center of this shadow is on the meridian line, the sun is on the meridian. A mark can then be made in some convenient place where the sun shines in at a window or door, then by referring to the almanac at any time it may be seen how much the sun is fast or slow of true time; this will give the correct time within the fraction of a minute.

New York, September, 1877. D. C. CHAPMAN.

Who Built the First Railroad in the United States?

To the Editor of the Scientific American:

In the "American Historical Record," Vol. I, page 543, in an article by Theo. Livingston Chase, under the caption "The First Railroads and Locomotives in the United States," the author asserts that the first railroad in this country was that built in 1807, by Silas Whitney, on the western slope of Beacon Hill, near Boston. Can I obtain any information which will lead to the verification of this date? Up to the publication of the article above mentioned, priority had always been given to the tramway built in 1809 by Thomas Leiper, Esq., of Philadelphia, to move stone from his quarries in Nether Providence (near Ridley, Delaware Co., Pa.), The contemporaneous Philadelphia newspapers all speak of this tramway as the first road of its sort in America. Mr. Leiper made a preliminary experiment in the presence of a number of prominent citizens of Philadelphia, in the Bull's Head Tavern Yard, Northern Liberties, on July 31st. 1809, and immediately afterward the work on the railroad in Nether Providence began. The railroad was finished in October, 1809, and is thus described: "It was built for the transportation of stone from the quarries of Thomas Leiper, Esq., on Crum Creek, to his landing on Ridley Creek, a distance of about one mile. The ascents were graded incline planes, and the superstructure was made of white oak with cross-ties and string pieces. The cars or trucks were very similar to those now in use, the wheels being made of cast iron with flanges."

In the absence of any direct evidence confirming the date of the Beacon Hill Railroad, this road will, of course, take prominence as being the first authentic railroad built in this country, but I trust that if any such evidence exist, it will be brought to notice. The subject deserves consideration as well for its historical as its scientific interest.

R. P. ROBINS.

Philadelphia, Pa.

Soldiers' Rations.

A soldier in the field, whether marching or fighting, must put forth more muscular energy than in times of peace; and according to Dr. Parkes and other authorities, it is the nitrogen in his food, more than anything else, that is necessary to the activity of the muscle, and this is required in greater quantity in proportion to the increase of work. That hard labor can be performed for some time without any increase of nitrogenous diet is true no doubt, but in this case it is at the expense of the nitrogenous constituents of other parts of the body, in the neighborhood of the muscle, and it would be impossible for a man to continue such labor for any length of time. Whether the nitrogenous matter he assimilates is contained in meat or bread seems to be a matter of little import. An English soldier who gets a three quarters of a pound ration of meat daily is said to be no better off, as regards the nutritive character of his diet, than a German soldier, whose staple food is rye bread, and this one can well believe, looking at the constituents of the two food stuffs. Meat from a lean animal contains but 12·8 per cent of nitrogenous matter, whereas samples of rye which have been analyzed have been found to contain as much actually as 15.8 of the same body. Moreover, the amount of water in a pound of meat and a pound of bread is a matter that must not be overlooked, for while in the former it amounts to 57 per cent, in the latter case it is only about 40. As, too, a loaf of bread constitutes of itself a very perfect diet, the starch and fat it contains supplying the calorifiant or heat-producing matter necessary in animal food, we may assume that troops fed upon good bread are as well off as those supplied with more costly rations. At the same time it cannot be denied that different climates and different conditions have a vast influence upon dietary, and while British soldiers require a goodly allowance of meat to sustain their energy, the Turk rarely tastes such food from one week to another. In fact, in the Moslem soldier we have the most easily satisfied of beings, so far as the commissariat is concerned. He does not even require bread, but will fight for weeks and months together upon rations of meal or bruised Indian corn, which serves him indifferently for breakfast, dinner, and supper. The Russian has rather better food, although from our point of view his fare may appear frugal enough. Two pounds of black bread and a quarter of a pound fresh meat, or bacon in lieu thereof, with garlic, salt, and plenty of tea, seem to be the daily rations of the Czar's soldiers, though a coarse sweet bean, known in this country as the locust bean (Johannisbrod), is occasionally, also employed as food. There is no knowing what the composition of Russian bread is, but assuming it to be for the most part of rye or Indian corn, there should be little difference between the nutritive qualities of the rations of the Turks and Russians, supposing, that is, the soldiers in both cases receive pretty well as much as they can eat. There is enough nitrogenous matter to make muscle and bone, as well as sugar and starch, or non-nitrogenous bodies to supply animal heat and to support the respiratory organs. Taking milk as the most perfect food we have for our standard, which may be said to be made up of nitrogenous matter, oil, and sugar, we find that the proportion of nutritive, to heat-producing or calorifiant matter, is one to two. Beans and peas come next in order to milk, the proportion here being as one to three, while in oatmeal it is as one to five, and in rye, wheat, Indian corn, etc., as one to seven or eight. Thus the Turk and the Russian, being fed mainly upon rye and Indian corn, derive equal benefit from their rations, although the Muscovite soldier gets additional energy, no doubt, from the small ration of meat allowed him.

The highly nutritive character of pea flour at once points to the *raison d'etre* of the pea sausage of the scientific German soldier. This newly invented food stuff consists, as our readers probably know, of peameal and bacon fat, suitably seasoned, and pressed into skins and boiled. The ordinary daily ration of a German soldier is 2 lbs. of rye bread and a dinner of soup, which sometimes has a piece of meat floating in it, but generally does not; this, together with a scanty stipend, which barely suffices to buy him a cup of coffee in the morning and a herring, or salted cucumber, to eke out his bread with, constitutes the whole of his allowances. In the last European war, these comestibles were replaced during some portion of the campaign by the *Erbswurst*, and there cannot be a doubt that the health of the Teuton army was improved by a regular and sufficient supply of this suitable food, while at the same time it greatly simplified the commissariat service of the invaders. Butchers, bakers, army ovens, and cooking pontoons were for a while dispensed with, and thus it was possible for corps and regiments to move, when necessary, without a great deal of impedimenta. Moreover, as we have seen, the pea flour gave that extra nutrition which troops subject to unusual exertion, coupled with exposure to cold and frost, required. To the English palate the pea sausage had an unmistakable taste of tallow, and there is no doubt that all kinds of fat and grease were employed in its production when the supplies of bacon ran short. Animal fat of some kind was, however, absolutely necessary to supply the system with heat, and combining the former in this way with pea flour was a most happy idea. The pea sausage might either be eaten cold in the condition in which it was issued to the soldier, or made into a sort of soup with boiling water.

And here we may mention a circumstance of especial interest to scientific men, in connection with the manufacture of this new food. The *Erbswurst* was produced in such huge quantities that it was found to be absolutely impossible to procure a sufficient number of skins and bladders to contain the preparation. All sorts of substitutes were tried. Oiled fabric and vegetable parchment, as well as other waterproof materials, were essayed in vain, for an envelope was required which was elastic and unaffected by boiling water. At last a chemist stepped in and solved the problem. He proposed the use of gelatin mixed with bichromate of potash, or in other words the process employed by photographers now-a-days in producing what are termed carbon prints. It is well known that if a solution of gelatin and bichromate of potash is spread upon paper and exposed to light, the gelatin becomes insoluble in a very short time, and will effectually resist the action of cold or hot water to dissolve it, this principle being in fact that upon which photographic prints are produced, the portions of a surface which refuse to wash away constituting a picture. This same mixture was used for treating the sausages. The food was pressed into proper shapes and then dipped into the bichromated gelatin solution, after which it was exposed to daylight for a couple of hours, when the gelatin formed a tough skin around it, capable of being boiled with impunity. Turning to the British soldier we find in him the most daintily fed of all warriors, unless it was the Servian in last year's war. If we are to believe special correspondents, the rations of the Servian soldiers were almost unlimited, and furnished a striking contrast to the fare of the frugal Turks. An oka, or 2½ lbs. of brown bread, half an oka of fresh meat, together with a modicum of rice, meal, and paprika, was the daily ration, the last named comestible being employed for making soup; the *pot-au-feu*, so we were assured, was to be found simmering in camp from early morn till noon, and then only came off to make room for the coffee kettle. The Servian soldiery, too, usually had a ration of spirits called slivovitch, or plum brandy, allowed them, and yet withal they had no such powers of endurance as the maize-fed Turks. In this country a soldier's ration is three quarters of a pound of meat and one pound of bread, which is supplemented in war time by a quarter of a pound of cheese, together with cocoa or tea, sugar, etc. In the Crimea there was a standing order that hot tea should always be kept ready when practicable, so that the men might partake of it at any time, and in the Abyssinian and Ashantee campaigns the camps were never broken up of a morning before the troops had been supplied with a cup of warm coffee for breakfast. Tea and coffee exercise the same effect upon the system as wine and spirits, but stimulative action is less marked, and our commanding officers are enjoined never to issue a ration of spirit except under extraordinary circumstances, as in the case of distressing marches, or when troops are engaged in the trenches or up at the front. And as we have said, with this apparently liberal feeding, our men do not receive so much actual nourishment or nitrogenous matter as the German soldier, whose mainstay is the 2 lb. loaf of black bread he receives daily. The meat, bread, sugar, etc., received by our soldiers in the Crimea yielded, we are told by the Royal Commissioners, but 23·52 oz., of nutritive principle, while Germany gives her soldiers 32·96 oz., which is still further increased when the latter are fed on such highly nitrogenous diet as the pea sausage. The Turks, poor as their food may seem to us, probably derive as much nutriment from it as English troops from their bread, meat, and cocoa, for, weight for weight, the Turkish rations contain more nitrogenous matter. If, too, their meal is what is termed "whole flour," it will, since it includes the husk, contain more nitrogen still, and, like oatmeal, be one of the most generous foods known. Our Scotch troops, we fancy, would be little the worse if fed solely on porridge for a time. The reader may remember Lord Elibank's retort on Dr. Johnson's definition of oats as the food of horses in England and of men in Scotland: "Yes," said he, "and where else will you find such horses and such men?" A growing soldier, hard at work all day at gun drill or other laborious work, does not buy extra meat when he is hungry, but foregoes his beer at the canteen for another pound loaf, thus approaching his diet very nearly to that of the German warrior, whom we have shown lives almost entirely on bread and enjoys the most nutritive fare. At the same time it is necessary to bear in mind that the conditions under which a man lives must guide the nature of his food. A man inhabiting a cold climate, such as ours, requires more animal food than would be the case if he lived in a country nearer the equator, and British troops, we fear, would lose much of their energy if fed altogether on farinaceous food. But, as we have striven to show, it is not always a so-called liberal diet which affords the soldier the greatest quantity of nutriment.—*H. Baden Pritchard, in Nature.*

Casting Boxes for Saw Mandrels.

Wet a piece of thin writing paper with oil, and wrap it it around the journal of the mandrel (the oil will cause the paper to stick to the journals); let the joint in the paper come on the side of the journal between the boxes; heat the boxes before pouring off; lay the mandrel in and let it remain until the journal and box are both warm, but not so as to burn or scorch the paper. The mandrel should then be taken out, and the oiled paper stuck around it. Pour the metal around the outside of the paper after the lower boxes are poured; pack between the two with layers of paper, and put on the upper box, bolting it down. After the upper box is poured, take it off and take off the paper, which will leave the journal of the mandrel free to run without heating. As the journals wear down so as too become too loose, take out a layer of paper from between them.

Effect of Cheap Japans as Dryers.

Cheap japans, used as dryers, are in part responsible for a large class of paint troubles, which are described under the head of "chipping," "cracking," and "becoming fatty." Too many painters are led away by cheap japan (on account of its good drying qualities), that has but little binding and less elastic hardening properties; and color ground in it with a little oil (which it has no desire to mix with) is liable to curdle as soon as you put them together, and gets gritty or fatty. Thin it down with turpentine, and let it stand over night, and it will look like liver in the cup; and as the turpentine leaves it, it gets spongy.

Cement for Petroleum Lamps.

A cement particulaly adapted for attaching the brass works to petroleum lamps is made by boiling three parts resin with one part of caustic soda and five of water. The composition is then mixed with half its weight of plaster of Paris. It sets firmly in half to three quarters of an hour. It is said to be of great adhesive power, not permeable to petroleum, a low conductor of heat, and but superficially attacked by hot water. Zinc white, white lead, or precipitated chalk may be substituted for plaster, but hardens more slowly.

Vermilion.

Vermilion is a mixture of sulphur and mercury, and is frequently found to turn to a dark brown color if exposed to the atmosphere. A remedy for this is said to be to add one eighth part flour of sulphur to the paint when mixing. To detect adulteration in vermilion, place a little on a red hot iron; if pure, it will evaporate entirely; if not, there will be an earthy residue.

ANILINE BRONZING FLUID.—Take ten parts of aniline red and five of aniline purple, and dissolve in 100 parts of alcohol at 95°, taking care to help the solution by placing the vessel in a sand or water bath. As soon as the solution is effected, five parts of benzoic acid are added, and the whole is boiled from five to ten minutes, until the greenish color of the mixture is transformed in a fine light-colored bronze. This bronze is stated to be very brilliant, and to be applicable to all metals, as well as to other substances. It is easily laid on with a brush, and dries promptly.

USE OF POWDERED PUMICE STONE ON VARNISHED WORK.—Pulverized pumice stone is used to remove the gloss and imperfections on varnished surfaces. It is applied by rubbing with woolen cloth and water. Rotten stone is used in the same manner, but applied only on work that requires polishing.

LEAD and zinc do not really unite. When melted together and allowed to cool slowly, the lead falls to the bottom. If kept together in fusion and repeatedly stirred, the zinc sublimes with great rapidity.

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IMPROVED MITER MACHINE.

The annexed engraving represents a new miter machine adapted to the uses of carpenters, frame makers, and other workers in wood. It is easily adjustable, the saw is accurately guided, and means are provided for taking up the wear of the blade.

A is the miter box; stationary and movable bars support the saw guides, B, and rest on a rotating support placed directly beneath the center of the miter box. The bars are connected by means of eyebolts at each end. The pivot of the movable bar passes through the eye, and the stem of the eyebolt enters horizontally through the stationary bar, and is held at any desired point by means of a set screw. Below the bars and not shown are two short lever arms having a rod passing between them which supports a spring. This spring serves to close the posts together, and they are locked together by means of latches, C, at the top, so that when the saw is in place the posts cannot be spread apart.

The guide rollers, B, are constructed with a groove at the top for holding the back of the saw, while the two flanges near the bottom steady the blade. Between these parts the slides of the rollers are cut away as shown, so as to prevent the lodgment of sawdust which might clog them and prevent their rotation. The saw blade has a socket, D, formed at each end into which vertical bars from the top or back bar enter. These bars are perforated and a pin is inserted through the side of the socket into one of the holes in order to hold the saw. As the blade becomes worn the pins can be shifted, so that the edge is retained always at the same distance from the back, and its relative position to the guide rollers will remain always the same. A set screw, E, serves to draw the blade tight.

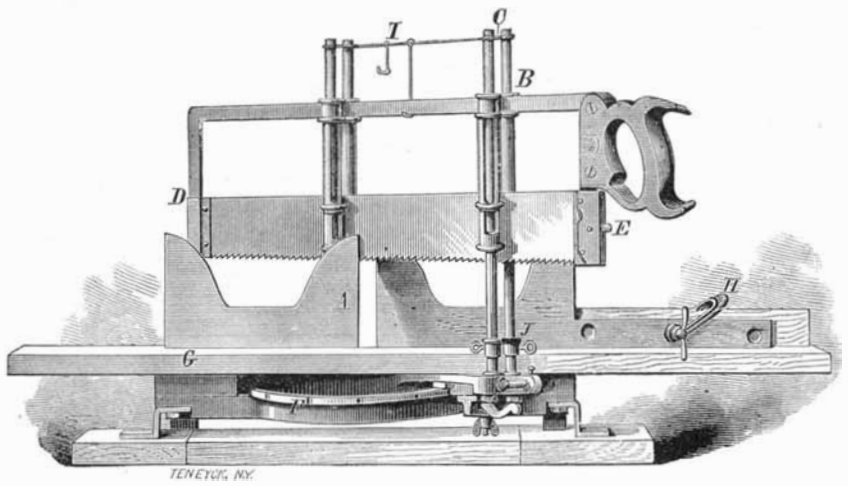
A quadrant, F, suitably graduated, is attached to the front of the frame, and the supporting bars move over it and are secured at any point by a clamping screw. The bedplates for the support of the working sole, G, are secured to the frame and have their inside ends beveled so as to allow the supporting bars to swing between them. The sole is made of any desired length, and the work to be cut lies upon it, resting against the back of the box. When any number of pieces are to be cut of the same length, they are simply gauged by setting a clamp, H, to the desired position. A rod extends across between the posts, and a hook, I, depends therefrom to support the saw when not in use. The depth of the cut is regulated by means of adjustable collars, J, which may be set to arrest the rollers when the saw reaches the bottom of its travel.

Patented February 13, 1877. For further particulars relative to sale of patents address the inventor, Mr. John P. Tierney, at Whittier & Fuller's, Sacramento, Cal.

NEW METAL GRINDING MACHINE.

The annexed engraving, which we extract from the *Revue Industrielle*, represents a new metal grinding and dressing machine devised by M. Bollmann. The carriage, L, on which the work is fixed, receives reciprocating motion by means of gearing moved about the axes, H, and governed by a toothed wheel having a hand brake. This toothed wheel receives motion, at M, from the driving pulley. The lifting and lowering of the carriage is effected by the wheel, D. The small hand wheels, B and C, on the left serve to produce transverse motion of the carriage and to regulate, by means of a spring and friction brake, the pressure with which the work is held against the stone.

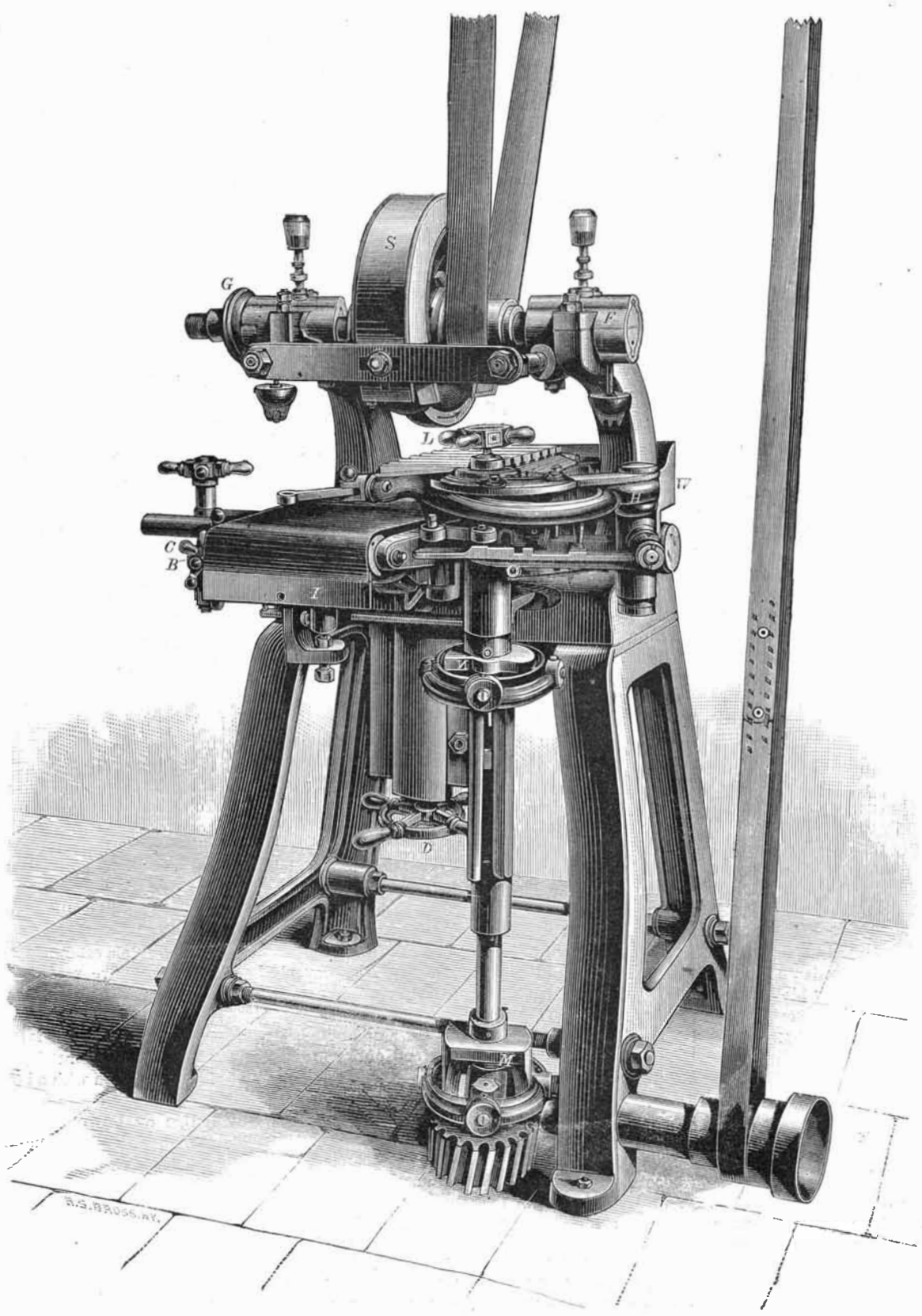
The latter has a sheet iron cap, S, and a wrought iron guard to prevent accidents in case of its rupture. The movement of the carriage is such that the object is always presented before the wheel which rotates at the average velocity of 5,760 feet per second. A second stone may be added at G, on the same spindle, being received between the flanges, for use on small work.



TIERNEY'S MITER MACHINE.

The remaining features of construction will be readily understood from our engraving.

The working parts are fastened to the iron bed, which is securely bolted to the standards. Bolts or screws, which can be readily removed, hold the machine firmly in place to the floor.



NEW METAL GRINDING MACHINE.

Awards at the Paris Exhibition of 1878.

The French *Journal Officiel* publishes a report to the Marshal-President concerning the Exhibition of 1878, from the Viscount de Meux, Minister of Agriculture and Commerce. The document states that the forward state of the works, both on the Trocadéro and in the Champ-de-Mars, leaves no doubt that the buildings will be completed by the end of October, two months earlier than had been counted upon. Already all the foreign countries which are going to take part in the pacific struggle know the place they are to occupy, and the space reserved for French exhibitors is allotted. Under those circumstances the Minister considered that the time had arrived to determine the question of recompenses. To accomplish that object he called together the Superior Commission. It commenced its task by appointing a sub-committee, presided over by M. Dumas, permanent secretary of the Academy of Sciences, who drew up a scheme, and submitted it to the general body. The matter was maturely deliberated, and, having been adopted, and finally approved by the Minister of Agriculture and Commerce, he recommends it for the sanction of the Marshal-President. The main features of the project are that a sum of $300,000 shall be devoted to recompenses, to be awarded by an international jury. That body is to consist of 650 members, 350 foreigners and 300 Frenchmen. The former are to be divided among all nations exhibiting, in proportion to the space occupied, the number of their exhibitors, and the importance of the objects. In addition 325 supplementary jurymen—175 foreigners and 150 French—are to be nominated. The foreign members are to be appointed by the government of each country; the French members will be designated by decree on the proposition of the superior commission. The document is followed by a decree ordering it to be carried into execution.

Chlorophyl and its Uses in the Arts.

Frémy has recently published some new and rather surprising statements in regard to chlorophyl. According to this eminent chemist we have in chlorophyl a mixture of phylloxanthine and phyllocyanate of potassium. The following proofs are adduced:

1. On treating green leaves with 62 per cent alcohol he obtained a yellow solution of phylloxanthine; if this treatment then be continued with 70 per cent alcohol, the phylocyanine united to potash goes into solution.

2. The alumina lake of chlorophyl, when digested with 62 per cent alcohol, also gives up nothing but phylloxanthine.

3. If we have a solution of chlorophyl in alcohol of high percentage, and treat this with a mixture of ether and hydrochloric acid, the ether takes possession of the phylloxanthine and is colored yellow; while the hydrochloric acid dissolves the phyllocyanine with a blue color. (The acid must be diluted with an equal volume of water and the ether added last.)

4. If some baryta water be poured into an alcoholic solution of chlorophyl, a dark green barium phyllocyanate, insoluble in alcohol, is formed, while the alcohol acquires a beautiful yellow color due to dissolved phylloxanthin.

The barium phyllocyanate is not decomposed by carbonic acid; all other acids, even the most feeble organic acids, decompose the phyllocyanine and turn it brown. If, however, we employ sulphate of potassium (sodium or ammonium), we obtain by double decomposition barium sulphate and potassium phyllocyanate, which dissolves in alcohol with a splendid blue

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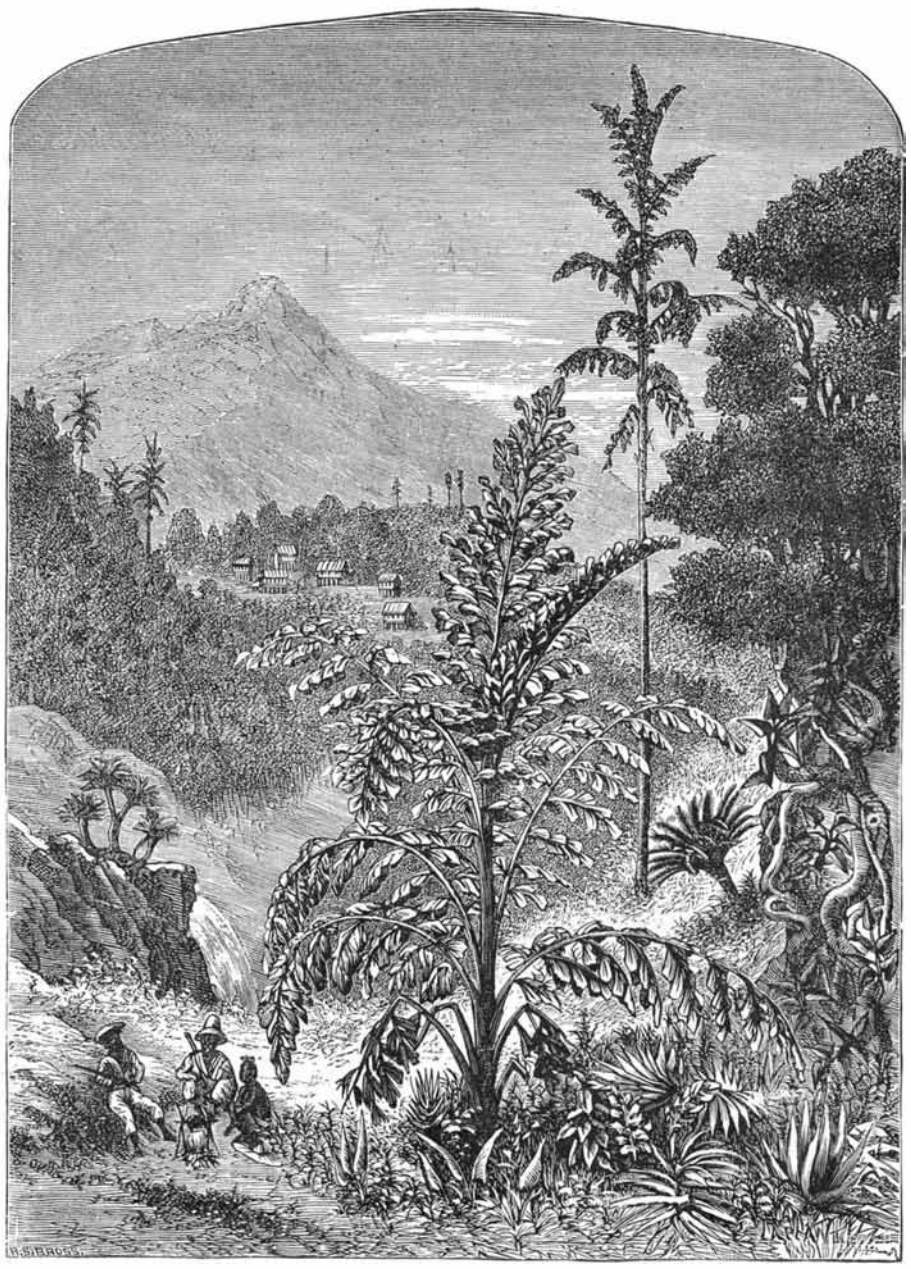
color. This salt is also soluble in ether and in the hydro carbons, as well as in water containing a slight excess of alkali. If linen be dyed with this potassium phyllocyanate solution, the fiber takes it up and can be washed with water and not give it out, but it is dissolved by alcohol or ether. Before the spectroscope the salt exhibits the well known black bands in the center of the red. When the leaves turn yellow they lose, as has long been known, a large portion of their potash, but a part of it remains bound to the phyllocyanide. On the ground the phyllocyanide is decomposed by fermentation and the potash given back to the soil.

In the preparation of preserved and canned vegetables, the use of copper salts to brighten the color is so general that Pasteur declared recently that it was scarcely possible to find a single box of shelled peas in all Paris, in which copper could not be detected. Hence from a sanitary point of view we greet with pleasure the discovery, by Guillemare and Letecour, of a substance which will render the use of this poisonous substance unnecessary and superfluous. They color the vegetables with chlorophyl. Their process is as follows: Spinach or leguminous leaves are treated with caustic soda, in which the chlorophyl is soluble. The solution is now precipitated with alum, and the lake thus formed well washed. It is then dissolved in sodium phosphate, which has previously been saturated with acid calcium phosphate. When vegetables are heated for five minutes or more with this solution, they take up the chlorophyl and hold it so firmly that they will not give it up subsequently by heating to 117° C. (242° Fah.), in the cans or boxes in which they are to be kept or sold.—*Dingler's Journal.*

THE WINE PALM.

The species of palm represented in the annexed engraving is called *caryota urens*, popularly known as the wine palm. The genus of which it is a member is a small one, containing only nine species—which number might probably be yet further reduced—all of them natives of India and the adjacent islands. They are lofty trees, having bipinnate leaves, which are easily recognized by the shape of the leaflets; these, instead of being long, narrow, and tapering, as in most palms, are wedge-shaped, tapering to the base, and broad at the upper extremity, where they are curiously and irregularly toothed or jagged. The male and female flowers are borne either upon one spike or occasionally upon separate ones, and the roundish, fleshy fruits are of a purplish hue, each containing one or two seeds. The fruits of *c. urens* are very sharp and acrid; so much so, indeed, that it is stated they will produce a strong burning sensation if applied to the skin, and from this property the species has acquired its specific name. Although certainly of less economic importance than the cocoanut and some other palms, this caryota is a very useful tree. Beginning with the trunk, a small quantity of very hard wood is yielded by its outer portion, of which the Cingalese make pestles for beating their rice. The inner portion or pith of the trunk is much more important; it is made by the natives into bread, or boiled by them into thick gruel, in either of which conditions it is highly nutritious; it has the same properties as sago, of which it may be considered a kind. From the leaf stalks a very strong, tough fiber is obtained, called kittul or kettule fiber; from this many articles are made, such as ropes, brooms, and baskets; while a woolly material, which is scraped off the base of these stalks, is sometimes used for caulking boats; the leaf stalks themselves are employed as fishing rods, for which they are very suitable, being light, tapering, and elastic. The most important part of the tree, however, is the spike of flowers, from which a large quantity of the juice is obtained; this juice is known as toddy, or palm wine, and it is stated that as much as 100 pints will be yielded by a good tree in the course of twenty-four hours. When boiled, this juice yields very good palm sugar, or jaggery, as it is called; about 8 gallons of the juice, boiled over a slow fire, will yield 4 gallons of thick syrup. To this syrup small pieces of the bark of *shorea robusta* (the saul tree) are added, and when boiled again the jaggery is produced. The manufacture of this sugar is undertaken by a particular caste of natives, and from this caryota and two other palms (*cocos nucifera* and *borassus flabelliformis*), all the sugar used in Ceylon is obtained.

Some of the finest quality, made by the head men, forms an excellent substitute for Chinese sugar candy. The cakes of jaggery, which are about as large as an ordinary bun, are wrapped separately in plantain or banana leaves, and are hung up until required for the market or for other purposes. The tree is sometimes called the jaggery palm, from the product which it yields. Although not so common in cultivation as some other palms, the caryota is sometimes met with.

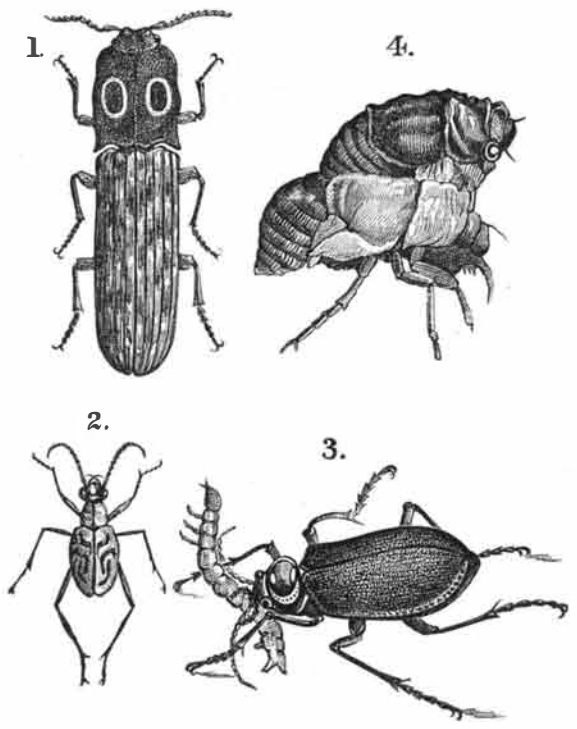


THE WINE PALM.

ABOUT SOME INSECTS.

BY C. FEW SEISS.

The largest elater or spring beetle we have in the United States, is the velvet spotted elater, *Alaus oculatus*, Esch., (Fig. 1, natural size). It received its specific name, *oculatus*, from the large eye-like spots upon its prothorax, which, however, have no connection with the insect's power of vision, but are simply ornamental markings. Some time ago a specimen was sent to me, with these remarks: "I caught it on the pavement, but not with my fingers; no indeed, its eyes looked too wicked. There happened to be a



match box lying near it, so I pushed the ugly brute in it with a stick. If it had not been for that match box you never would have seen this bug with a wicked eye."

The young of this beetle are often found in old apple trees, feeding upon the wood. The perfect insect I have never observed abroad earlier than June 14th. That it completes its transformations much sooner is evident, for my brother dug, from a rotten stump, a newly transformed beetle, on the tenth of February of the present year.

Along the sandy sea beaches of New Jersey is found a swift-footed white beetle, with peculiarly arranged black lines upon its back (elytra). It seems to be the *cicindela dorsalis* of Say (Fig. 2). The name *dorsalis* refers to the lines upon its back, but as most of the *cicindelidæ*, or tiger beetles, have similar placed markings, this may be called in English the strand tiger beetle.

I once saw large numbers of these beetles upon the carcass of a common fowl, which evidently had been washed overboard from a passing vessel. They were most numerous upon the fowl's head and were tearing away at its eyes and comb with a seeming relish. They did not bury themselves in the carcass like true carrion beetles (*silphidæ*), but remained upon the surface, inserting their jaws only in the flesh. They feed also upon insects; I saw one eating a green grasshopper; and although it was larger than the beetle itself, it flew some distance with it before alighting.

The green insect hunter, *calosoma scrutator*, Fabr., (Fig. 3) belongs to the family *carabidæ*. It is a swift runner, predaceous in habits, and beneficial in the number of caterpillars and other injurious insects it devours. Its elytra are bright green with a red border; its body beneath, glossy green; its prothorax, blackish blue, margined with gold; and its legs, deep purple. In Pennsylvania and New Jersey it is a common insect during the summer months.

Fig. 4 represents a frosty cicada, *cicada pruinosa*, Say, quitting its pupa case. It leaves its shell in a manner similar to the seventeen year cicada, *C. septemdecim*, Linn. It is called *pruinosa*, from the frost-like substance found about its body. It is an annual species, never very numerous, and is found even in the center of the city of Philadelphia.

Effect of Poisonous and Antiseptic Gases upon the Fermentation of Fruit.

BY LECHARTIER AND BELLAMY.

Fruits when excluded from access of air continue to live for a certain length of time, and the duration of this process depends upon the state of ripeness in which they were plucked. This life of the cell is manifest by a destruction of the sugar accompanied by the production of alcohol and carbonic acid. If the fruit be exposed to poisonous or antiseptic vapors, the vital power of the cells is totally destroyed, or at least greatly reduced. On the 6th of September, 1875, three experiments were tried with green apples (*pommes de locard*), which had not yet attained their natural size. In this young fruit the decomposing power of the cells is very considerable and takes place in a comparatively short time. An apple weighing 49 grammes was enclosed in a flask, and in 49 days produced more than 400 c. c. of gas. On the 25th of October this process ceased, and did not begin again within seven months, when the experiment ceased. In three other experiments, likewise begun on the 6th of September, three apples, plucked the same day, were suspended in separate flasks. On the bottom of the first flask were placed a few crystals of carbolic acid, in the second flask was placed a fragment of potassium cyanide, and in the third a piece of camphor. Under the influence of carbolic acid and hydrocyanic acid vapors, which were diffused through the atmosphere of the first two flasks, no trace of gas was developed for 83 days. Only a small quantity of gas was developed in the third flask. Hence the action of the camphor was less energetic than the other substances; it diminished the vitality of the cells without completely destroying them.

These experiments agree in their results with those of Gayon, who knew nothing of these investigations of Lechartier and Bellamy. Gayon made two series of experiments, one begun December 9, 1876, and the other March 15, 1877, for the purpose of studying the effect of certain vapors upon the intercellular fermentation of fruit. He employed for this purpose apples (*pommes Dieu*) which were suspended in vessels provided with gas delivery tubes. In the flasks were placed layers of chloroform, ether, and carbon disulphide A comparative experiment was made in ordinary air without the addition of any volatile substance. The results agree with those in the above note completely. The evolution of gas began rapidly in ordinary air; in one case 305 c. c. of gas were generated in five weeks, and in a second case 376 c. c. were evolved in six weeks. With chloroform and ether, however, not a single bubble of gas was given off; the apples changed color both within and without. With carbon disulphide fermentation began; and in one experiment, 15 c. c. of gas was evolved in four days, with another experiment 25 c. c. in five days. Still the evolution of gas soon ceased and the color changed in a similar manner, as before mentioned.

Ether and chloroform seem to totally prevent fermentation in the same manner as carbolic acid and hydrocyanic acid, whereas carbon disulphide and camphor merely retard it.—[*Comptes Rendus*].

[We have recently published some facts in regard to the antiseptic action of carbon disulphide, and chloroform was pro-

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posed several years ago as a good means of keeping milk sweet, and we could have expected that their action upon fruit would have been similar. We would suggest to our readers to repeat these simple experiments with other volatile substances, naphtha, the essential oils, chlorine, sulphurous acid, and the like.—EDS.]

Improved Carmine Ink for Draughtsmen.

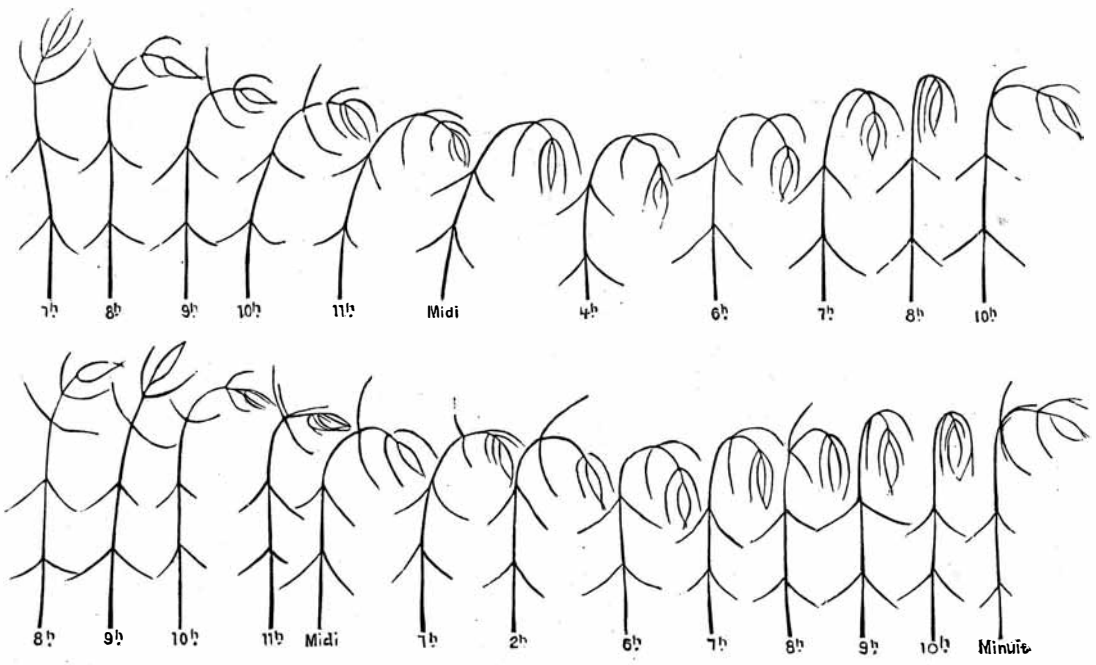
The solubility of carmine lake in caustic aqua ammonia is attended with this disadvantage: that in consequence of the alkaline properties of ammonia, the cochineal pigment will in time form a basic compound, which, in contact with a steel pen, no longer produces the intense red but rather a blackish color. To avoid this evil, the *Polytech. Notizblatt* recommends to prepare the ink as follows: Triturate 1 gramme of pure carmine with 15 grammes of acetate of ammonia solution, and an equal quantity of distilled water, in a porcelain mortar, and allow the whole to stand for some time. In this way a portion of the alumina which is combined with the carmine dye is taken up by the acetic acid of the ammonia salt and separates as precipitate, while the pure pigment of the cochineal remains dissolved in the half saturated ammonia. It is now filtered and a few drops of pure white sugar syrup added to thicken it. In this way an excellent red drawing ink is obtained, which holds its color a long time. A solution of gum arabic cannot be employed to thicken this ink, as it still contains some acetic acid, which would coagulate the bassorine which is one of the natural constituents of gum arabic.

The Best Form of Electro-Magnet.

M. Du Moncel has recently conducted investigations in order to determine the relative diameters of the iron core, and of the magnetizing coil, for producing the best results. He has concluded, first by calculation and afterward by direct experiment, that the thickness of the coil should be precisely equal to the diameter of the core. This is a valuable point, and one which electro-magnet makers will doubt less at once turn to profit.

THE SPONTANEOUS MOVEMENTS OF THE HORNWORT.

For some time past the works of Dutrochet and Payer, resumed and continued by Duchatre, Sachs, and others, have familiarized botanists with the movements of torsion or flexion peculiar to certain vegetables. M. Rodier has recently called attention in *La Nature* (whence our engraving) to a new phenomena of the same class which he has observed in certain aquatic plants which live entirely submerged. His investigations have chiefly been carried on with relation to the hornwort (*ceratophyllum demersum*) which, he states, at certain epochs, executes spontaneously regular movements having a well marked periodicity in their amplitude. The hornwort grows in slow streams or ponds and has sessile leaves cut into thrice-forked thread-like rather rigid divisions. The ordinary variety has a smooth marginless fruit beaked with a long persistent style, and with a short spine or tubercle at the base on each side. Its ordinary attitude is vertical, and at the upper part of the stem, where the leaves are slightly separated, the peculiar motion is manifested. These movements consist in a bending and regular return of the stem or branches combined with a more or less marked torsion. For six hours the stem bends more and more; then during the following twelve hours it returns to its former position, and continues bending over in the opposite direction for four hours, when it again returns, occupying a like period to regain its upright position. Thus a branch is vertical at 6 A.M.; at maximum inclination at noon; straightened again at midnight; inclined to maximum in opposite direction at 4 A.M.; returned vertical at 8 A.M., and so on. These oscillations, though generally occupying the same length of time, become less marked as the plant grows older, owing to its becoming more rigid, and ultimately they are confined to the end of the stem.



SPONTANEOUS MOVEMENTS OF THE HORNWORT.

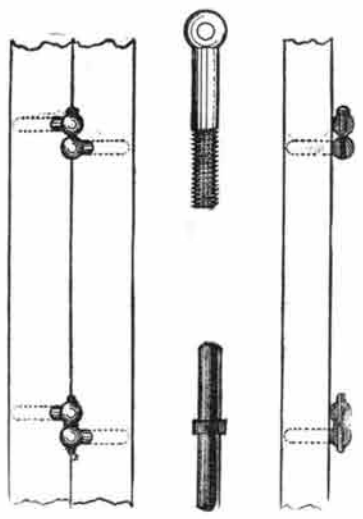
The torsional movement occurs sometimes in one direction, sometimes in another. Angles of 35° have been measured in nine, 120° in seven, and 450° in nine hours.

The annexed engraving exhibits the movements of a plant observed on March 30 and 31 last. The direction of motion is northeast and southwest. No explanation of the phenomenon is offered. It continues the same when (1) the light is suppressed, (2) when the plant is illuminated by means of a mirror from a direction opposite to that normally the case, (3) when the light is half shut off by a screen, and (4) when the light is transmitted through red glass.

BEAUTIFUL WHITE FINISH.—A beautiful finish may be given to parlors or extra work in houses, by mixing zinc white in white dammar varnish. This forms the china gloss of commerce.

BEAUDET'S IMPROVED HINGE.

The annexed illustration represents a new hinge which is claimed to possess superior advantages in point of cheapness and durability. It consists simply of two eye bolts, one screwed into the casing, the other into the door. The apertures in the bolt heads come in the same vertical line. Throrgh the eyes a pin having a collar around its middle portion is inserted. The inventor states that the device



saves fully one half the workman's time in hanging doors, blinds, etc., in comparison with the hinge in common use.

For further information address the inventor, Mr. John Beaudet, 109 Tremont street, Cambridgeport, Mass.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

Position of Planets for October, 1877.

Mercury.

Mercury keeps very nearly the path of the sun. It may be seen in the early morning before sunrise, almost exactly in the east. The best time to look for it will be from the 8th to the 13th.

On October 1, Mercury rises at 5h. 16m. A.M., and sets at 5h. 12m. P.M. On October 31, Mercury rises at 5h. 52m. A.M., and sets at 4h. 36m. P.M. On October 7, Mercury rises a little before 5 A.M., and north of east.

Venus.

Venus will continue visible throughout the month after sunset, setting a little after 7 P.M., being the first of the four bright planets to disappear below the western horizon.

Mars.

Although Mars was in the best position for astronomical work in September, it will be quite as interesting to the ordinary observer during October, the diminution in size being scarcely perceptible to the eye, and its position being more favorable for evening observation.

Mars rises south of east on October 1 at 4h. 49m. P.M., and comes to the meridian a few minutes after 10 P.M. At the time of southing it will have an altitude of about 36° (in this latitude). Saturn will be east of it, and above it by 4½°.

An ordinary glass will show the disk of Mars of a ruddy hue, and the white spot at the upper part (as seen in the telescope), which is supposed to be the icy pole: that which has been turned away from the sun. With a good glass, dark spots are seen on Mars so well defined that they can be measured. The return of these spots as Mars revolves on its axis is watched in order to determine the time of revolution or the length of its day. The small satellites are not within the reach of ordinary telescopes.

On October 31, Mars rises at 2h. 47m. P.M., and comes to the meridian at 8h. 18m. P.M.

Jupiter.

The second bright planet which sets in the evening, Venus being the first, is Jupiter. On October 1, Jupiter sets at 9h. 31m. P.M., and on October 31 it sets before 8 P.M.

Although Jupiter's position is less and less suited to observation, it can still repay one for turning the telescope upon it, as the varied positions of its four moons are always interesting.

Saturn.

On October 1, Saturn rises at 4h. 54m. P.M., and sets the next day at 3h. 57m. A.M. On October 31, Saturn rises at 2h. 52m. P.M., and sets at 1h. 52m. A.M. of the next day.

Although Saturn appears small and unnoticeable when compared with the brilliancy of Mars, it is a much larger planet and a more interesting object. The ring which surrounds it is now very narrow in appearance, so that a small glass scarcely shows the opening, and it seems to be a bright band projecting each side of the spherical body.

Uranus.

Uranus is still very nearly in the same position with the bright star Regulus. It passes east of the star in October. It will be directly east of Regulus, on the 27th, when at the south, but as it comes to the meridian in the morning, it cannot be seen at that time by ordinary telescopes. It can, however, be found before sunrise very readily, by sweeping the small telescope around east of Regulus.

Neptune.

Neptune will be in the best position on October 29, but cannot be seen without a good glass.

A New Kind of Sugar in Walnut Leaves.

Tanret and Villiers have discovered in the leaves of the walnut tree a new sort of sugar nearly allied to the inosite. They have given it the name of nucite. Its chemical composition may be expressed in the new system by the following formula, $C_6H_{12}O_6 . 2H_2O$. It has a sweet taste, crystallizes in inclined orthorhombic prisms, has a specific of 1.54, is easily soluble in water, alcohol, ether and chloroform. It does not turn the plane of polarized light nor reduce Fehling's copper solution. It is not fermentable, even after boiling with diluted sulphuric acid. When treated with nitric acid, it does not form either oxalic nor mucic acid.

Precipitation of Manganese with Hydrogen Peroxide.

The determination of manganese is of such importance that many different methods have been devised for precipitating it from solution. The reagent mostly used at present for the purpose is bromine, although it possesses some disadvantages that we need not describe here.

Dr. G. Rosenthal has recently published this method of determining manganese with hydrogen peroxide. His process is as follows: After precipitating the iron with sodium acetate, the filtrate is evaporated to 150 c. c. For every 10 or 15 centigrams of manganese he adds 10 c. c. of a solution containing 10 per cent by volume of hydrogen peroxide and allows it to stand 30 to 60 minutes exposed to a gentle heat. It is then gradually neutralized with a few drops of dilute ammonia, when a black flaky precipitate of hydrated manganese peroxide is thrown down, while oxygen is liberated from the action of ammonia upon the excess of hydrogen peroxide. It is now gently heated and more ammonia added, when the gas evolution continues some time. It is easy to arrange it so that at the end of the operation the odor of ammonia is still barely perceptible. This is easily recognized from the tendency of the precipitate to separate from the liquid, very similar to precipitation of hydrated ferric oxide by ammonia. The liquid is decanted and precipitate washed with hot water, first by decantation then on a filter, until the chlorine reaction ceases. The precipitate should look black. A large excess of the peroxide should be avoided. Much chloride of ammonium is also injurious. Rosenthal has employed his process with success in the analysis of spiegeleisen, ferromanganese, slags and ores. He also directs attention to the non-necessity of double precipitation of the iron, if the solution be neutralized warm until it begins to be turbid, heat nearly to boiling, when no precipitate should fall, then add a measured volume of a hot 25 per cent solution of crystalline sodium acetate in the proportion of 10 parts to 1 part of iron, heat again to boiling, when the precipitate should settle nice and clear.—*Dingler's Journal.*

LIQUID SHOE POLISH.—The following is a German recipe: Dissolve 3½ ozs. of shellac in half a pint of alcohol. Rub smooth 25 grains of lampblack with 6 drachms of cod-liver oil, and mix. A few drops are to be applied to the leather with a sponge.

THE longer linseed oil used for painting is kept the better, both in regard to its drying qualities and its transparency.

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Interesting Facts about Metals.

Platinum, the densest of the ordinary metals, possesses also one of the highest points of fusion. The metal fuses when exposed to the heat of the oxyhydrogen blowpipe. When in the state of very fine wire it may be melted into small globules by the heat of an ordinary mouth blowpipe, and is quite readily fused in very small quantities by the aid of a hot blast supplied to an ordinary Bunsen gas flame. Platinum belongs to the class of metals which soften before they attain perfect fluidity. This peculiarity gives it the valuable property of welding, or the uniting of surfaces without the use of solder, and enables the finely divided metal, technically termed the metallic sponge, to be wrought into a solid and compact bar. Platinum is not known to be volatile, though perhaps, at sufficiently high temperatures, it, in common with all substances, would be vaporized. Platinum does not combine directly with oxygen, and therefore would not be wasted during the process of melting.

Gold melts at about 2,016° to 2,190° F., according to different authorities. It is neither affected by water nor air at any temperature, and is not attacked by ordinary acids. It is the most malleable of all the metals, and may be beaten into sheets of surpassingly wonderful thinness. Its very great malleability renders it unfit for use for jewelry or for coinage until its hardness, and consequent durability, are increased by alloying it with silver or copper. Exposed to the heat of the oxyhydrogen blowpipe, it is known to be vaporized; and it was formerly supposed that it was not volatile at lower temperatures, but the researches of Napier and Makins show that volatilization occurs at temperatures of an ordinary muffle furnace when alloys of silver and gold are cupelled with lead. An analysis of deposits taken from the chimney of a small reverberatory furnace, in daily use for cupelling gold for months, showed 14 per cent of silver and 7·1 grains of gold for every 8 ounces of silver. Still, after the destruction of a lot of jewelry by a fire, a great proportion of the gold should be recoverable, since but a small quantity, if any, would be volatilized; and the metal is not at all affected by air or water, as before remarked.

Lead melts at about 630° F. Unlike gold, it combines readily with the oxygen of the air, forming various oxides—mainly litharge, a product of the direct oxidation of the metal. When melted and exposed to the atmosphere, it absorbs oxygen very rapidly; so that, unless caution be exercised in melting, it is apt to waste from the direct oxidation, and especially from the fact that, at a white heat, it boils and volatilizes. When in a very finely divided state, metallic lead combines so rapidly with oxygen that it takes fire while falling through the air, and burns with a red flash. This metal possesses the valuable property of welding in the cold, provided the surfaces joined are clean and free from oxide. Lead forms alloys with nearly all the metals. Many of its alloys are of great value. It alloys but imperfectly with copper, cobalt, nickel, and iron. The following are some of the more important alloys:

Alloys.—Type metal, an alloy consisting of 83 parts of lead and 17 parts of antimony, with sometimes a little zinc. This alloy, heated in the air, rapidly loses its antimony by oxidation—the antimony oxidizing at a lower temperature than the lead; the oxide resulting from the action always contains, however, according to Watt, a large percentage of the oxide of lead.

Stereotype plates sometimes contain ¾ part tin; music stereotype plates contain, tin 12 parts, lead 7 parts, and anti mony 1 part. The general composition of ordinary stereotype plates is: lead 70 parts, antimony 15 parts, and bismuth 15 parts; this alloy expands on cooling, and is therefore applicable for casting stereotype plates.

Solders.—Lead alloyed with tin forms various solders: fine solder contains 2 parts of tin and 2 of lead; common solder, equal parts of tin and lead; coarse solder contains, lead 2 parts, tin 1 part; plumber's solder is the same as the last.

Pewter is composed of 80 parts lead and 20 parts tin, but to these copper, antimony, or zinc is generally added. Lead alloyed with tin and bismuth forms a variety of alloys that are remarkable for their extraordinarily low melting points.

Rose's fusible alloy, formed of 2 parts of bismuth, 1 of tin, and 1 of lead, melts at about 95° C., or 203° F., or less than the boiling point of water.

Britannia metal is an alloy of equal parts of brass, tin, antimony, and bismuth; or, better and safer, 100 parts of French pewter, 5 of antimony, and 5 of brass.

Bronze contains copper, tin, and lead.

Bell metal contains 5·6 parts of zinc, 10·1 parts of tin, 80 parts of copper, and 4·3 parts of lead. All of the foregoing alloys are more or less wasted or dissipated by the action of heat, owing to the ready oxidation or volatilization of the the lead, or of some one or other of its constituents.

Silver melts at about 1873° F., or at about a bright red heat. Like gold, it is not attacked by air or moisture—the tarnish which appears on silverware being caused by gaseous compounds containing sulphur, which are frequently present in the air. A very extraordinary property is possessed by silver of absorbing a considerable number of times its oxygen when highly heated in that gas, or even in common air. This oxygen is not combined with the silver, but is given off at the moment of solidification of the metal—a circumstance which produces the peculiar arborescent appearance common to masses of the pure metal. The presence of a small percentage of copper prevents the absorption of oxygen. According to Lampadius and Depretz, silver gives off vapor at very high temperatures. The presence of a small quantity of arsenical vapors greatly increases the ease with which it is volatilized.

Bismuth melts at about 518° F. It is but little oxidized by contact with air; if strongly heated, it burns with a bluish flame; at a high temperature it volatilizes freely. It is obtained from its ores by simply exposing them to heat.

Copper melts at about 2100° to 2300° F. It is very ductile, malleable, and tenacious; at very high temperatures it is slightly volatile; it is unaffected by dry air, but in the damp becomes coated with an adherent green crust. When exposed at a red heat to the air, it is rapidly oxidized, and becomes encrusted by a black scale. At a high temperature copper burns with a green flame.

Ntckel is somewhat less fusible than pure iron; this would put its melting point at about 3000° F. Like iron, it is capable of becoming magnetic, but loses this property at temperatures above 660° F. Though combining readily with oxygen, it is not oxidized when highly heated, since heat drives off the oxygen as fast as it is fixed.

Cadmium melts at about 500° F. It is commonly associated with ores of zinc, and being a very volatile metal distils off when zinc ores are roasted.

Manganese has a high melting point, but fuses when exposed to the heat of a good wind furnace. It has a strong attraction for oxygen, and will even take it from water at low temperature.

Iron, intrinsically the most important of the metals, fuses at temperatures dependent on its purity. When containing carbon, or in the condition of cast iron, it melts at 2786° F., but when pure, or in the condition of wrought iron, a temperature of 3280° F. is necessary to melt it. Iron softens before melting, and possesses in a marked degree the property of welding. It has powerful affinities for oxygen, taking it from the air when moist—a circumstance which explains the fact that it is seldom found in a pure or metallic state, except in meteorites. Dry air at ordinary temperatures does not affect it, but when heated to redness it absorbs oxygen and becomes coated with a scale of black oxide. When in a finely divided state, the metal burns while falling through the air, and even in the condition of ordinary filings it burns with brilliant scintillations when thrown into a fire or the flame of an ordinary gaslight. Its high point of fusion renders it an admirable protection of woodwork against ignition from neighboring fires, though its rate of expansion, as shown in the table, somewhat vitiates its protective action in case of fires, from its tendency to warp from unequal expansion.

Tin melts at the temperature of 455° F. It is not acted on to any extent by air or water. When exposed to a temperature somewhat above its melting point, it absorbs oxygen greedily, and is converted into a whitish oxide, known technically as pasty powder.

Zinc melts at about 770° F. It undergoes a series of remarkable changes under the influence of heat. At ordinary temperatures it is comparatively brittle; between 250° and 300° F., it is quite malleable, and in this state may be readily rolled or beaten into sheets, which have the valuable property of retaining their malleability when cold. The brittleness of the metal at ordinary temperatures is doubtless to be attributed to its crystalline structure, which is probably effaced during the operation of rolling at higher temperatures. At 400° F. zinc becomes so extremely brittle that it may be readily powdered. Zinc is very volatile at a bright red heat, and in the presence of air burns with a bluish-green flame.

Antimony melts at about 800° F. Like zinc, it boils and volatilizes, but at a higher temperature—this phenomenon occurring with zinc at a bright red heat, and with antimony at a white heat. It is unaffected by air at ordinary temperatures, but will, if sufficiently heated, burn with a white flame.

Aluminum has a melting point intermediate between that of zinc and silver. It is a good conductor of electricity, being about eight times a better conductor than iron; is also a better conductor of heat than silver. It has an exceedingly low specific heat, and therefore does not take a long time to liquefy. It has been subjected to high temperatures in closed vessels without exhibiting any tendency to volatilize. It is not oxidized by the air even at a strong red heat.—*American Exchange and Review.*

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NEW AGRICULTURAL INVENTIONS.

IMPROVED THRASHING MACHINE.

James P. Gordon and John W. Gordon, Coal Valley, Ill.—This invention relates to an improved grain thrasher and separator, to which the sheaves are fed for thrashing and separating the grain, and by which the straw is carried off in quick and effective manner, the straw-stacker being supported in convenient manner on the separator; and the invention consists of a revolving cylinder with convex thrashing teeth, taking up and separating the grain from the straw, in connection with a fixed piece with concaved teeth. Back of the thrashing-cylinder is a slowly-revolving beater or regulator, and back of the regulator a more rapidly-revolving "flipper," which conduct the straw and grain forward, and separate them from each other in connection with an endless carrier with intermittently tilting and link-connected sections, having wire rake teeth and drop holes. The concave teeth present less resistance to the passage of the straw than the convex cylinder teeth which act on the heads or ears and thrash the grain out while the straw is passed through without being cut or broken into small pieces. There being no short pieces of straw, the grain is more easily cleaned, as the work of fans and riddles is facilitated. The convex cylinder teeth and fixed concave teeth are more durable than the ordinary teeth, as they do not stick on the straw, but pass through, exerting a sharper stroke and thrashing more rapidly than the common tapering teeth. By thinning the teeth of the concave and thickening those of the cylinder, the striking surface of the latter is increased, while the resisting surface of the former is diminished. The space being thus enlarged for the material to pass through the concave, a greater quantity of straw may be passed through in a given time. The concave may be so attached to the separator frame that it may be lowered or raised, and thereby the distance between the sides of the teeth enlarged or decreased. The main advantage of the convex and concave teeth is that they thrash out the grain and draw the straw through without cutting up the same.

IMPROVED RIDING CULTIVATOR.

Squire J. Hinkle, Saratoga, Ind.—The object of this invention is to furnish an improved riding cultivator, which shall be simple in construction and easily guided and controlled, and which shall be of light draft, and without any downward pressure upon the tongue. The whiffletrees are pivoted to pass a little above their lower ends. By this construction the tongue and doubletree are raised above the plants being cultivated, while the points of the draft attachment are lowered so to be about in line with the points of resistance. The rear end of the machine is supported on caster wheels. The inner ends of the braces, connecting the fore wheels with the hind ones, are attached to the middle part of the cross beam, and the inner ends of the braces are attached to a block. To the rear ends of the blocks are pivoted the forked forward ends of the plow beams, so that the said plow beams may have a free vertical play. This construction allows the rear ends of the plow beams to be moved freely in any direction. The rear parts of the plow beams are forked, have their rear ends curved downward, and their inner arms the shorter, to bring the plows to the proper distance apart.

IMPROVED CORN-STALK CUTTER.

Benjamin C. Clevenger, Chanute, Kan.—This invention relates to an improvement in the class of corn stalk cutters in which blades are caused to project intermittingly through a slot in a revolving drum. The invention consists in the construction of the drum, the distinguishing feature being the arrangement of the bars which form the guides for the blades, whereby the circular heads of the drum are rigidly connected and braced, and suitable slots or openings are formed, through which the blades may work in and out. The arrangement referred to consists in placing the outer edges of the bars close together, and their inner edges several inches apart, thereby securing the circular drum heads rigidly together, and forming a narrow slit or opening sufficiently wide for the blades to work through, yet allowing space behind said openings for the vibratory movement of the blades. The knives are bolted or otherwise detachably attached to the outer ends of pairs of arms, the inner ends of which are pivoted to the axle. The axle is bent twice at right angles at the inner sides of the wheels, so as to form a long crank, and its ends are attached to the frame in such a way that the crank of the said axle may project downward, so that as the machine is drawn forward, the knives may project as they approach the ground, so as to cut the corn stalks into pieces as they lie upon the ground.

IMPROVED CULTIVATOR.

Jacob Summers and Joseph Trimble, Muncie, Ind.—The object of this invention is to furnish an improved cultivator, which shall be so constructed that it may be readily adjusted for use as a two horse or a one horse cultivator, and that when used as a one horse cultivator it may straddle a row of plants while the horse walks upon one side of said row. The invention consists in the combination of the bar, the two bolts, and the eye with the forward ends of the two beams, and in the arch formed of the two adjustable bent bars and the connecting bar or link, in combination with the forward parts of the two pairs of beams, as hereinafter fully described. The two parts of the cultivator are exactly alike, except that the position of the beam is reversed. The beams, at a little distance from the outer ends, are curved outwardly, and then extend to the rearward in lines parallel with their forward part. The bend of the inner beam is such as to bring its rear part in line with the forward part of the outer beam; and the bend of the outer beam is such as to bring the plows to a proper distance apart. When the machine is to be used as a two horse cultivator, one of the handles is detached and the beams are connected by a bar or bolt. When the machine is to be used as a two horse cultivator, the forward ends of the two beams are connected. The lower parts of the bars are horizontal, and have several holes formed through them to receive the bolts, by which they are secured to the said pairs of beams, so that, by adjusting the bars, the plow beams may be adjusted farther apart or closer together, as may be desired. This construction leaves the pair of plow beams free to move to adjust themselves to uneven ground, and allows them to be readily moved in guiding them in cultivating crooked rows, and avoiding irregular hills.

IMPROVED BEE HIVE.

Duncan L. Murff and David Kyle, West Station, Miss.—The object of this invention is to furnish bee hives which shall be so constructed that the surplus honey can be readily removed, that will prevent the moth from entering, and that shall be simple in construction and convenient in use. The invention consists in the bee hive formed by the combination of the vertical end boards, the horizontal board, the inclined rear and front boards of the brood chamber, and the front board and the hinged cover of the honey case chamber with each other; in the triangular honey cases, in combination with the triangular chamber formed above the triangular brood chamber.

IMPROVED CULTIVATOR.

John C. B. Thomas, Palmyra, Mo.—The object of this invention is to furnish an improved cultivator, which shall be so constructed that it may be readily adjusted to cultivate tall plants without injuring them, which will allow one horse to advance a little before the other without turning the plows out of line, and will enable the cultivator to work to the end of a row and close to a fence. The invention consists in the adjustable frame work formed by the combination of the axles, bent upward at right angles, the three armed couplings, the cross rod, and the set screw, with each other, and in the cross slots formed in the inner arms of the three armed couplings, to receive the set screws that secure the ends of the cross bar in said arms, to give a play to the frame.

IMPROVED FENCE.

Josiah V. Richardson, Tuckerman, Ark., assignor to himself and R. E. Richardson, of same place.—The invention relates to the construction of the fence panels, and the application of a clamp for securing them together, whereby they are made to form a line of continuous self-supporting fences. The posts are placed on opposite sides of the boards forming the panels, near their ends. and a short horizontal piece is attached to the lower end of the posts. The overlapping ends of the panels are fastened together by a notched piece, which clamps the sections securely. The ends of the boards forming the corner panels are notched, so that the boards interlock when connected together to form a corner.

IMPROVED PLOW SULKY.

Samuel Pennock, Ithaca, N. Y.—The object of this invention is to provide a plow sulky in which the wheels may be adjusted independently and easily, and in which the plow beam may be moved laterally and vertically. The plow beam is clamped to the arm by bolts, and a plate. The wheels

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are adjusted to the proper height by rotating a worm wheel by means of a worm. The center of gravity of the machine may also be moved, so that more or less of the weight of the plow, the frame, and the driver, may be thrown on the tongue.

IMPROVED TOBACCO STRIPPING AND DRYING MACHINE.

William Davies, Henderson, Ky.—This invention relates to improved application for extracting or separating the stems from leaf tobacco, and for rolling out or flattening and drying the leaves at the same time, so as to be readily booked for market. The invention consists of hollow heated and revolving rolls, of which one has an annular groove and circumferential cutting knives at both sides thereof, said knives registering with corresponding circumferential recesses of the other roll. The manner of operation is as follows: The operator places one end of the leaf between the rolls, with the stem pointing either end into the space between the knives, the leaf being then caught and drawn through between the rolls. As the leaf passes into the rolls it is stretched out to its natural limits either by the hands of the operator or by rollers with diagonal grooves or otherwise. The heat of the rollers dries the leaf at the same time, and dispenses, thereby, with the separate drying operation.

IMPROVED CORN PLANTER AND FERTILIZER DISTRIBUTOR.

Frederick U. Stokes, Urbana, O.—The object of this invention is to furnish an improved machine which shall be so constructed as to open furrows to receive the seed, drop the seed, and cover it, and then drop a fertilizer upon the hills, to mark the hills, and at the same time promote the growth of the plants, and which shall be simple in construction and automatic in action. The plows for opening a furrow to receive the seed have the upper ends of their shanks pivoted to supports attached to the frame in such a way that the said plows may be swung forward to raise them from the ground. The seed hoppers are attached to the frame and have discharge holes formed in their bottom, through which the seed passes into spouts and is deposited in the bottom of the furrow in the rear of the plows. The dropping slides work upon the bottom of the hoppers, through holes in the sides of said hopper. The slides are provided with holes to receive the seed from the hoppers and convey it to the discharge holes in the bottom of said hoppers. The slides are prevented from carrying out any more seeds than enough to fill their holes by the cut-offs attached to the hoppers directly over their discharge holes, and beneath which the slides pass. The operating mechanism of the machine is so arranged that the fertilizer dropped from the rear hoppers may fall exactly upon the hills planted from the forward hoppers, so that by using plaster or other light-colored fertilizer the hills will be plainly marked, rendering any other marking of the land unnecessary, while enabling the field to be planted in accurate check row.

IMPROVED FERTILIZER.

Charles F. Panknin, Charleston, S. C.—This invention relates to a compound consisting of a mixture of finely powdered bone or mineral phosphates and finely powdered sulphur, the said ingredients being mixed together and applied in a dry state; and the conversion of the insoluble phosphate of lime into soluble phosphate of lime is effected by the sulphuric acid eliminated by the natural oxidation of the sulphur of the mixture in the soil to which it is applied. To prepare the fertilizing compound, take 95 parts of insoluble phosphates, in a finely powdered state, and mix with it 5 parts of finely powdered sulphur. This mixture when applied to the soil becomes slowly transformed, the sulphur being first converted into sulphuric acid by a natural process of oxidation, and uniting with the insoluble phosphates to form a soluble phosphate, which is dissolved by the moisture of the soil, and acts in the same manner as phosphates made by artificial processes. The advantage of this method of manufacturing soluble phosphate are: First, the mixture contains no sulphate of lime and no water of combination, requires no expensive machinery to make the mixture, and therefore the cost is less as compared with superphosphates prepared with sulphuric acid. Second, as the ingredients are mixed together in a dry state, with sulphur in so small a proportion, the percentage of phosphate of lime in the compound is greater as compared with that in the superphosphates prepared in the usual way.

IMPROVED PEANUT THRASHER.

John Lee Underwood, Smithfield, Va.—The object of this invention is to provide for peanut growers an improved machine by which the peanuts may be picked off the vines without tearing the vines to pieces, so that the latter may be used in more advantageous manner for feeding purposes. The peanuts and vines are at the same time cleared of any adhering dirt, which is separated with the lighter peanuts by the machine from the heavier ones. The peanut vines are fed along the top of a horizontal wire frame to the action of a ribbed roller, and are drawn through between roller and frame, so as to be exposed to the clearing action of the rapidly revolving reel without tearing the vines to pieces. A reel armed with wires comes against the wires of the frame in the rotation of the reel, and taking hold of the peanuts and removing them from the vines, while they are prevented from being drawn down or torn by the retaining action of the longitudinal wire frame and ribbed roller. The pease are dropped from the reel on to a hopper and discharged through the mouth of the same on a horizontal and laterally reciprocating finger bar, on which the peanuts are exposed to the blast of a fan. The lighter peanuts, small pieces of vine, dirt, and other impurities are separated by the fan blast from the heavier peanuts, which are dropped on an inclined plane and discharged into a receiving receptacle below the machine, thus picking the peanuts without tearing the vines, and without crushing the pease, in a rapid, thorough, and economical manner.

IMPROVED MOWER.

Carl Lindbom, Stockholm, Sweden.—This invention consists in simple and effective devices for actuating the cutter bar of a mower or reaper. The sections are provided at the inner circumference with undulating faces having alternating projections and depressions, which run parallel to each other, so that the projections of one section enter the depressions of the other, and form thereby an undulating groove in which the crank pin of a shaft projects. The construction of the wave wheel admits, by the interposition of intermediate disks of varying thicknesses, the adjustment of the distance of the outer disk sections, which forms a considerable advantage when the same are worn off by long use. When it is desired to throw the cutter bar out of action, the lever is locked by a pivot catch, which throws the crank pin out of gear with the groove of the wave wheel, and discontinues the action of the same on the crank shaft and cutter bar. The reciprocating motion is thus imparted to the cutter bars of mowers and reapers by a simple, durable, and easily repaired and adjusted mechanism.

IMPROVED GRAIN AND GRASS SEED HARVESTER.

John W. Walton, Germantown, Ky.—The object of the invention is to effect an improvement in the class of machines designed and adapted for stripping the ripe seed from the standing stalks of grass or grain, and by this mode of harvesting the same enabling the farmer to avoid the labor and expense incurred in the operation of cutting the grass or grain stalks, and consequently thrashing out the seed. The invention consists in so attaching the seed box or receptacle to the wheeled frame, and in connecting such mechanism therewith as will enable it to be adjusted vertically, corresponding to the height of the standing grass or grain, without throwing it out of an approximately horizontal position.

IMPROVED REVERSIBLE PLOW HOOK.

John A. Vann, Belvidere, N. C.—The object of this invention is to furnish an improved plow hook to take the place of the ordinary plow clevis which shall be simple in construction, easily adjusted to cause the plow to run deeper or shallower in the ground, strong and durable, and which, when one of the hooks becomes worn, may be reversed and the other hook used. The invention consists in a double or reversible draft hook. If it is desired to have the plow work still deeper in the ground, the lower hook may be turned back, and the upper hook turned forward. With this construction, when one of the hooks becomes worn, the device may be reversed and the other hook used, so that the device will last twice as long as an ordinary draft hook or clevis.

IMPROVED IRON FENCE.

Samuel H. Dickey and John D. Davis, Oxford, Pa.—The improvement consists in the arrangement of sets of parallel horizontal bars in connection with the pickets, and means for fastening the same, the said pickets being connected at the point of crossing by means of a bolt, clamp, and springing armament. The improvement also consists in the construction and arrangement of the line posts and braces, and of a clamp for connecting and holding the rails at their junction.

IMPROVED SEED PLANTER.

Emanuel Gerber, La Fayette, Ga.—The object of this invention is to furnish an improved machine for planting corn and other seed, which shall be so constructed that it may be readily arranged to plant the seed at any desired depth, at any desired distance apart, and any desired number of kernels in a hill, and which shall be simple in construction and convenient in use. The lower edges of the forward part of the hoppers that are over the dropping weeel are notched, to prevent the kernels from being broken while being carried out by said dropping wheel or plate, and the spaces thus formed are covered by leather or other suitable material, to prevent any more seed from being carried out by said plate than enough to fill its dropping holes. The number of kernels dropped for a hill may be regulated by adjusting the hopper so that its forward end may project to a greater or less distance over the dropping wheel. When the hopper is drawn back, so that its discharge hole projects over only a part of the dropping holes, the dropping holes will receive a less number of kernels.

IMPROVED PLOW STOCK AND SWEEP.

John S. Bowling and Robert Bowling, Alexandria, Ala.—The object of this invention is to furnish an improved plow, which shall be so constructed that the point and sweep can be adjusted to work at any desired angle, and which shall be simple in construction and convenient in use. The invention consists in the combination of the adjustable steel spring with the adjustable slotted foot, and with the bolt that secures the plow plate to said foot; and in the combination of the sweep, the hinged bar, and the adjusting bolt, with the adjustable slotted foot, and with a bolt that passes through said foot, which is slotted longitudinally from its rear end nearly to its forward end. The lower end of the beam is inserted in the slot of the foot a little in front of its center, and is pivoted to it by a pin or bolt. The plow plate is placed upon and is secured to the forward end of the foot by a bolt. To the rear end of the foot is pivoted the lower end of a bar, which passes up at the rear side of the beam, and its upper end passes between the arms of a U bar, and is secured to said arms by a bolt. Several holes are formed in the bar to receive a bolt, so that, by adjusting the said bar, the foot may be adjusted to hold the plow plate at any desired pitch. The U bar passes around the beam and is secured to it by a bolt or rivet. The sweep, which is made V-shaped, and is secured at its angle to the forward part of the bar, which is hinged to a plate placed upon the lower end of the bolt, and is secured in place by the nut of said bolt. The rear end of the bar has a hole formed through it, to receive a bolt, which passes up through the slot of the foot. Several washers or blocks are placed upon the bolt, so that the pitch of the sweep may be adjusted by placing the blocks upon the bolt above or below the foot, or some above and some below.

IMPROVED FRUIT PICKER.

H. Clement Berbeyer, Price, Mo.—The object of this invention is to furnish an improved device for picking fruit from trees where they cannot be reached by hand, which will enable the fruit to be picked and lowered to the ground without being injured, and which shall be simple in construction and convenient in use. The invention consists in an improved fruit picker formed of the pivoted cup having teeth formed upon its edge, the forked socket shank having teeth formed upon the ends of its forks, the cord, and the pulley, as hereinafter fully described. In using the device it is passed up beneath the fruit to be picked, in such a position that the said fruit may enter the said cup, and a slight twist will generally cause it to fall into the cup. In case the stem adheres firmly to the branch the picker is adjusted to bring the stem between the teeth of the forks of the shank, and a slight pull upon the cord will cause it to be cut by and between the teeth.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED PLATFORM WAGON.

Nathaniel B. Wood and Elliot R. Fitch, Hubbardsville, N. Y.—The object of this invention is to furnish platform wagons which shall be so constructed that the pole irons may be attached directly to the axle, in which the forward and rear axles shall be connected by a reach, and in which the springs will not bind, and shall be less liable to break than with the usual construction. With this construction the irons of the pole can be attached directly to the forward axle. This construction also enables the rear part of the pole to be made with an upward bend, which has heretofore been impracticable with platform wagons, Upon the side edges of each outer leaf of the springs are formed lugs, which project past the side edges of the inner leaves, and thus keep the said leaves in proper position. This construction avoids the necessity of making slots in the leaves, and thus weakening them.

IMPROVED VEHICLE BRAKE LOCK.

John Hahn, Spades, Ind.—This invention relates to an improved brake operating and locking device, which may be applied to any vehicle or railroad car; and it consists of a revolving screw shaft with hand crank, operating a traversing nut and slide frame, and thereby the lever connections. By turning the crank in one direction the nut is drawn up and the brake applied. By turning in opposite direction the nut is moved down and the brake released. The device is easily operated, and has the advantage of applying the brake in uniform and more or less powerful manner, and locking the same thereon as long as required, forming thus a reliable brake-operating device for vehicles,

IMPROVED TRUSSED WAGON AXLE.

Charles E. Cookerly, South Pueblo, Col., assignor to William Farnsworth, of same place.—The object of this invention is to furnish wagons which shall be so constructed that the axles will not be liable to break when the wagons are heavily loaded and drawn over rough and uneven roads. The invention consists in the combination of the skein bridges and the truss rod with the skeins and the axle; and in the combination of the jointed guard rods and the brace frame with the axle nuts, the axle, and the hounds. The truss rod passes over bridges upon the lower side of the axle, enters the lower parts of the inner ends of the skeins, passes along the upper sides of the skein bridges, passes out through the outer ends of the skeins and has nuts screwed upon its ends. The rod thus forms a truss from the top of the skein bridge to the axle bridge, and from the top of the skein bridge to the outer end of the skein, so that the axle cannot break without drawing the rod apart longitudinally. Tension rods are placed to keep the skeins in place, which serve to strengthen the axles, and prevent them from breaking at the inner ends of the skeins.

IMPROVED WAGON BRAKE SHOE.

Independence E. S. Alexander, Henry, Tenn.—This invention consists of a clutch to be used in the place of a brake shoe, that is composed of two notched or shouldered levers and a frame or base piece having ears, between which the said levers are pivoted. The object of the invention is to provide a brake shoe that may be applied with little pressure, and that will not wear the face of the tire. When it is desired to retard or stop the wheel, pressure is applied to the brake bar in the usual way, when the free ends of the levers, being forced back by contact with the face of the tire, clamp the edges of the tire between the shoulders.

IMPROVED WAGON TIRE TIGHTENER.

William G. McCreight, Atlanta, Miss.—The object of this invention is to furnish an improved attachment for the rim of wagon wheels, to enable the tire to be easily and quickly tightened without being removed from the wheels, and which shall be simple in construction, convenient in use, and effective in operation. It consists in the combination of the draw screw and the brace screw with flanges formed upon the ends of an open tire, so that by screwing in the draw screw and then screwing in the brace screw the draw screw will draw the ends of the tire toward each other and tighten it upon the fellies.

IMPROVED SPRING SEAT AND REACH FOR VEHICLES.

Adonijah J. White, Castile, N. Y.—This invention relates to an improved spring seat and reach for wagons which combines lightness and elasticity with a simple and cheap construction; and the invention consists of a centrally hinged reach in connection with a cross brace supported by rods from the upper section of an elliptic spring, which is centrally attached to a second elliptic spring arranged convexly to the former, and suspended from the bottom of the seat by means of rods or loops. The seat rests by tenoned arms in mortises of the reach sections, in front and rear of the hinge connection of the same. The suspended springs, in connection with the flexible reach and cross brace, impart to the seat the required elasticity, so that it does not raise or throw the rider on rough roads, but cushions the weight of the same in agreeable manner. A pin on the rim of the fifth wheel prevents the wheels from striking the side of the wagon when turning. The wagon can, by the combined spring seat and jointed reach, be made light, cheap, and durable, so as to exert less strain on the horse, and furnish an easy-going and comfortable wagon.

IMPROVED SLEIGH RUNNER FOR WHEELED VEHICLES.

Mitchell C. Wright, Chatham, O.—The object of this invention is to provide runners that may be readily applied to the bodies of wheeled vehicles to render them serviceable in winter. A thimble is fitted to the axle that takes the place of the axle box in the wheel. Upon the upper side of the thimble a step is formed, and upon its lower side a lug is made, to which braces are bolted. The braces are fastened to the knees of the runner, and the braces are bolted to the rave. The runner is supported by these braces at such a distance from the outer end of the axle as to run in the ordinary sleigh track, and several holes are made in the lug on the under side of the thimble to receive the bolt that retains the several braces, so that the runner may be adjusted. An arm is formed on each part of the support for limiting its motion. The thimble is retained on the axle by the same nut that retains the wheels. The runners are oppositely arranged for opposite sides of the vehicle. The front runners only need be provided with posts. The runner is readily applied to or detached from the axle, and when applied converts the vehicle into a complete sleigh. The runners are capable of independent motion, and the peculiar method of attaching the thills permits them to move freely.

NEW HOUSEHOLD INVENTIONS.

IMPROVED IRONING BOARD.

Francis H. Young and John S. Sheldon, Stanhope, N. J., assignors to said Sheldon.—The invention relates to an improved ironing board, on which shirts and other articles may be ironed with great facility, the board being readily stored away after use, and taking up but a small space. The invention consists of an ironing board whose front end is recessed to form a larger board for the bosoms and a smaller board for the sleeves, the front part being supported by a hinged adjustable leg and locking brace that fold to the board after use. The covering is secured to the board by means of a fastening wire that extends around the board, being laid into a circumferential groove in the edge of the board and fastened thereto at the ends. In this manner tags may be dispensed with, and the board readily covered again when the old cover is worn out. The front part of brace is extended forward and made of ring shape, for the purpose of being used as a rest or support for the flat iron when both hands are temporarily required for arranging the clothes on the board. When the brace is released from the upper leg section the leg may be readily swung up to the board, and thus the entire board stored away in folded state, taking up but a small space, and being instantly put up again for use with convenience and ease.

IMPROVED CHURN.

Charles P. Greene, Providence, R. I.—The object of this invention is to furnish an improved churning apparatus which shall be so constructed as to bring the butter in a very short time, and develop all the butter there may be in the milk, and which shall be simple in construction, convenient in use, and easily operated. The invention consists in an improved churning apparatus, formed of the case made in two parts, and provided with the partitions concaved upon their upper sides, the churn body made in two parts, and provided with the hopper and the lid, the three bevel gear wheels, the crank, and the two dashers.

IMPROVED CHURN.

Van Ranselear Wilcox and Aurelius Benedict, Perry, and George Benedict, Cleveland, O.—This invention relates to an improved churn dash, that works in quick and easy manner, for churning butter; and it consists of a tubular churn dash with enlarged conical lower part and top valve for admission of air. The dash slides in the wood-lined cream saver, and rests on a supporting spiral spring placed between the cream saver and a fixed flange or collar of the dash. The cream saver is supported in a socket that is attached by its slotted base to the churn lid. The upper end of the dash is provided with a wooden top or cap having a valve for the admission of air on lifting the dash, so as to accelerate the downward motion of the cream. When desired, a whistle device may be connected by a chain to the cap, and inserted on removing the cap, so as to serve as a signaling device or dinner horn. The churn dash breaks up the cream in rapid manner by the assistance of the pressure of atmospheric air, while the motion of the dash is made easy by the cushioning spring, so that the churn is worked in rapid, easy, and effective manner.

IMPROVED FOLDING BEDSTEAD.

William W. Rogers, Indianapolis, Ind.—The object of this invention is to provide a bedstead that may be easily and quickly folded together, so that it will occupy but little space, and that may be as readily unfolded and put into condition for use. To the legs of the bedstead, bars are jointed, which are also jointed at their lower and inner ends to a spider, and above the center of this spider an internally threaded sleeve is supported by braces that are attached to both it and the spider. These braces are also jointed to another spider which is placed centrally over the sleeve. Braces are also jointed to the spider and are provided at their outer ends with the forks which embrace the bars. A screw passes through the spider into the sleeve and is capable of drawing the spiders together when screwed into the said sleeve. A bed bottom, consisting of a netting of cords having a rope border, is provided with a number of hooks having oblong loops which are secured to the bottom by a strap of webbing, which passes around the rope border of the bottom, and through the oblong loops of hooks, and one or both of its ends are fastened by buckles. The manner of folding the bedstead is as follows: The screw is loosened, and the bottom removed, when the hooks are taken from their loops, and the screw removed from the sleeve, when the spider is raised up, drawing the braces with it. The legs and other parts may now be folded closely together. Although this improvement is described as applied to bedsteads,

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it is obvious that other articles of furniture, such as sofas, tables, etc., may be constructed on the same plan.

IMPROVED FAN ATTACHMENT FOR ROCKING CHAIRS.

John F. Rakes, Greenup, Ky., assignor to himself and William Bryson, of same place.—The object of this invention is to provide a fanning device for attachment to rocking chairs or cradles, to be operated by the motion of the same. A short piece of tube is secured to the bottom of each rocker. In this tube is inserted the lever end of the fanning device which is retained to the arms of the chair by pivoted rods. In the bottom of the tube attached to the rocker projects a short distance, the end of the tube forming a barrel for receiving a spiral spring. A rod runs through the tube and is secured at its lower end to a cap that shuts over the tube and incloses the lower portion of the spring. The upper end of the tube is squared to receive the squared end of the rod, which is curved, and to it is hinged a socket for receiving the fan. The upper end of the tube is supported by an arm which is pivoted to the under side of the arm of the chair, and embraces the said tube loosely, so that it may slide and turn in the arm as it swings on its pivot. One of the attachments may be used, or two may be employed, as may be desired. When the attachment is not in use the fan is folded down parallel with the tube, and the arm is turned on its pivot, bringing the said tube parallel with the back of the chair. By swinging the arm out at right angles to the arm of the chair, the apparatus is brought into position for operation. When the rocker of the chair is moved so as to raise its center from the floor, the spring throws the rod downward, drawing the short arm of the socket downward, and throwing up the fan. When the center of the rocker touches the floor the fan is thrown down by the movement of the rod. It will be seen that the chair, in rocking in either direction, produces a full stroke of the fan in both directions.

IMPROVED MILK STRAINER.

Henry T. Jones, Catskill, N. Y.—The object of this invention is to furnish an improved strainer for milk pails and other uses, which shall be so constructed that it may be easily and thoroughly cleaned, which shall be strong and compact, will furnish no passage for any dirt, and may be easily renewed as required. The invention consists in the combination of the double cam ring and the lugs with the gauze, the flange, and the plate, to which they are applied. With this construction, by turning the cam ring back to bring its lowest parts beneath the lugs, the said ring cam may be readily detached, allowing the gauze to be taken out and the gauze and spout to be easily and thoroughly washed and cleaned.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED HEMMER FOR SEWING MACHINES.

John P. Ioor, Indianapolis, Ind.—The object of this invention is to provide a hemmer for turning hems of different widths, that may be attached to sewing machines of various descriptions. A plate having a slot for receiving the thumb screw binds it to the sewing machine, and having an offset portion, the end of which is rolled under, forming a guide for the inner edge of the hem. The said guide is tapering, being largest at the end that receives the cloth; and upon the edge of the metal forming the same an ear is formed, which is bent upward so that it extends across the opening of the guide parallel with the plane of the plate. A bar is attached to the guide and extends through a slot in the plate, and to it a slotted bar is attached, which is offset, so that it may extend over the guide. A rib is formed on the plate for guiding the slotted bar, and a binding screw is provided for clamping it in any desired position. The hemmer is adjusted to the sewing machine so that the smaller end of the guide is in front of the needle. The cloth to be hemmed is placed between plates and around the ear. The width of the hem is regulated by adjusting the slotted bar.

IMPROVED CIRCULAR SAWING MACHINE.

John M. Shaw, Shaw's Mills, Ga.—The object of this invention is to provide a simple, inexpensive machine for sawing pickets, laths, staves, shingles, and for general work. Shingles may be sawed with this machine by bolting the timber and afterward setting the adjustable gauge one half inch from the front edge of the saw and about one eighth inch from a line drawn across the face of the saw at a distance of twenty-one inches, or a little more than the length of a shingle from the front edge of the saw. A stop block is fastened to the track for limiting the motion of the table. The bolt is placed upon the table and against the gauge, and is moved forward against the saw. As soon as the bolt is pushed forward it leaves the gauge, so that there is no friction between the gauge and the bolt. The bolt must be reversed end for end after having made three shingles.

IMPROVED BALANCE RYND.

John Smith and Jabez Snashell, Buffalo, N. Y.—The object of this invention is to furnish an improved balance rynd for millstones, by which the upper stone or runner is so poised on the rynd that it adjusts itself at all times to any unevenness in the bed stone, and insures thereby greater uniformity in grinding. The invention consists in a balance rynd having pivots at the lower and diametrically opposite ends, in combination with boxes set into the upper stone or runner, for balancing the same thereon. The support of the runner leaves the stone free to find its own balance, and takes the place of the fixed connection of the rynd with the runner. The boxes fit the pivot ends of the rynd, and allow the latter to oscillate without throwing the stone out of balance.

IMPROVED STEAM BOILER.

Henry S. Coleman, Chelmsford, Eng.—This invention relates to what is known as double boilers, the object being to lessen the consumption of fuel by maintaining such a circulation of water as will effectually prevent the formation of deposit on the bottom of the lower barrel of the boiler, and reduce the incrustation generally. In the present invention, instead of having in each connecting tube a circulation tube of smaller section than the connecting tubes, as previously made, there is a circulation tube in every alternate connecting tube only. In this case the circulation tubes fit in and form a continuation of the connecting tubes, and the water passes down the circulation tubes and rises through the intermediate connecting tubes. These tubes are so supported as to be readily moved out of the way when cleaning the boiler.

IMPROVED CAR AXLE BOX.

Richard B. Eason, New York city, assignor to himself and Silas A. Allen, of same place.—In this invention the box is simplified, the oil chamber is quickly filled and placed in position, and the oil fed to the packing and journal in proportion to the motion of the axle. The invention consists of a car axle box with lower extension chamber, and of a hinged or detachable oil chamber, with semi-circular or other shaped part fitting into the chamber of the box, and having an exit-opening and a valve for closing the opening when the oil chamber is inserted, but opening the valve when the oil chamber is in position, by the contact of the valve stem with the bottom of the extension. The oil chamber is seated tightly in the axle box or lower casing of the same.

IMPROVED DREDGING BUCKET.

John McKeever, Jersey City, N. J.—This invention relates to improvements in dredging buckets, by which they may be worked with great facility in opening and closing; and it consists of bucket sections swinging by fixed lateral pivots in triangular side frames, which support at their apexes the operating shaft. When the operating shaft is turned to open the bucket, the center chains are wound up and the side chains are unwound, while by closing the bucket the center chains are unwound and the side chains wound up, so as to change in this manner the bucket and raise and discharge the same, being then lowered and closed for taking up the next charge of mud, and so on, forming a dredging bucket of effective and quick construction.

IMPROVED SEWER TRAP AND FLUSHING GATE.

John Peter Schmitz, San Francisco, Cal.—This invention includes two devices—one a hollow float-valve which is hinged at the mouth of the sewer, and the other an extensible detachable gate placed athwart the cesspool or trap. The float-valve is closed except when the accumulation of water in the trap is sufficient to raise it. It may also be held closed by a rod or staff, when it is desired to allow water to accumulate in the cesspool, for the purpose of flushing the sewer. The gate or partition is perforated, formed in two parts which are connected by bolts passing through slots. The gate has laterally projecting fingers which take into the wall of the cesspool and hold the gate in place. The gate may be removed, or adjusted to a different position, by loosening the bolts and sliding one part on the other, so as to withdraw the pins from the wall.

IMPROVED SAWING MACHINE.

John J. Reinhart and William Houghton, Loogootee, Ind.—For constructing a cheap, portable, and easily running sawing machine it is necessary to use a vertically reciprocating saw, do away with the long pitman, and dispense with the crossheads and slides, and provide, in addition thereto, some appliance by which the saw is caused to recede from the kerf after making the stroke, so as to pass up clear, and is brought forward again at the top of the stroke to descend perpendicularly. The invention is intended to meet these requirements, and consists of a vertically reciprocating saw, operated by a forked pitman and vibrating arm at upper end, pivoted to an adjustable muley head. By changing the relative bearings of pitman and lower vibrating arm, any desired motion of the saw can be obtained. By the receding of the saw when ascending, a saw with curved or hooked cutting teeth may be used, of which each tooth operates in the nature of a chisel, cutting at right angles to the grain, so as to require less power than any other.

IMPROVED TOOL-CARRYING TRUCK FOR USE IN BORING OIL WELLS.

Henry T. Blackwell, Edenberg (Knox P. O.,) Pa.—The object of this invention is to furnish an improved machine for carrying the bits for boring oil wells from the tempering tub to the auger, and holding them while being screwed into the auger stem, which shall be simple in construction and convenient in use. The invention consists in the combination of the wheels and axle, the main frame, the curved rack bar, the brace bar, the pivoted bar, the spring bars, the round, the swiveled frame, and the gear wheel, crank, and pawl, with each other, as hereinafter fully described. The frame is designed to receive the bit, the cutting end of which rests upon the lower cross bar of the said frame, and which is secured in place by two hand screws passing through the side bars of the said frame. The side bars of the frame rest against the edge of a plate, shelf, or frame attached to the frame, the middle part of said edge being cut away to give space for the bit.

IMPROVED CAR COUPLING.

Floyd Heavener, Laramie City, Wyoming Territory.—The object of this invention is to provide an improved car coupling adapted to automatically couple cars of different heights with the common form of short link, and which shall always maintain the said links in proper horizontal position for entering the drawbar of the next car. The invention is an improvement upon that form of car coupling which employs a series of link throats for coupling with cars of different heights of drawbars, and a spring-seated receding support for the coupling pin, which is forced back by the entering link to allow the coupling pin to fall through and couple the cars. The improvement consists mainly in a spring-pressed stem carrying at its front end a crosshead extending through the several throats of the drawbar and combined with the same, the said crosshead having beveled faces for each of the throats, and performing the several useful functions. First, of supporting the coupling pin, and permitting the same to be tripped with an equal movement and leverage for all of the throats. Secondly, the sustaining the short link in horizontal position, and thirdly, serving as a spring cushion to permit the link to recede a little and adjust its outer end to the throat of the opposite drawbar, if said link in failing to enter the throat snugly should strike against one of the partitions.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED THIEF AND ROBBER TRAP.

William E. Wharton, Lawson, Mo.—The object of this invention is to provide for use in banks, stores, etc., a thief or robber trap, so constructed that it may be tripped by the cashier, proprietor, clerk, or other person stationed behind the counter, or in any other convenient place, and thereby precipitate the thief or burglar into the cellar or apartment below. The tilting sections constitute that part of the floor of a banking room which is in front of the counter. On removing the support of levers from the tilting sections, they will tilt and precipitate any one standing thereon into the cellar or apartment below. It is hence within the power of the cashier, clerk, or other person having access to the tripper, to tilt the sections whenever a robber has gained access to the bank or store, and thus precipitate him into a place of secure confinement without incurring the danger of personal encounter and injury.

IMPROVED ALLOY FOR PLATING METALLIC ARTICLES.

Moses P. Page, Eureka, Ill.—The object of this invention is to provide a cheap and readily fused plating composition or alloy, by which all kinds of metallic articles used in the household, shop, or farm, may be plated, so as to be protected effectively against corrosion, requiring less labor in being kept clean, and obtaining a superior and neater appearance thereby. The composition is obtained by taking one part of silver, ten parts of tin, one part of nickel, and four parts of copper, with a small quantity of carbon, and so on, the proportions being according to the articles and the degree of temperature to which they may be exposed. This mixture with the metals is then placed in a plumbago crucible, the vacant space above the metal being filled with charcoal heated with bituminous coal piled about it to the top of crucible, the coal surrounded by sheet iron to prevent the escape of heat. The crucible is covered with a plate of iron, except when the mass is being stirred. The heating is continued about two hours, when the mixture is taken off, thoroughly skimmed, and, after the subsidence of the red heat, poured into moulds. In regard to the carbon, a round plate of iron is used with a rod made stationary in the center, on the inside of crucible, and pass this through a perforated plate that forms the cover. This device keeps the pulverized carbon submerged in the fused metals. The carbonized plating is best adapted for bolt heads, carriage trimmings, and soft iron generally. The articles to be plated are dipped into the composition until thoroughly and uniformly coated with the plating material.

IMPROVED BUCKLE AND SNAP HOOK.

Fayette W. Knapp and Christopher Schallhorn, Fiddletown, Cal.—This snap hook is provided with a spring latch, which consists of a piece of sheet metal, bent so as to embrace the sides of the hook, and swinging on a rivet, which passes through both it and the hook. Ears are formed on the latch to prevent the ring inclosed by the hook from getting between the latch and the hook. A slot is cut through the sides of the free end of the latch to receive ears formed on the sides of the spring, which spring presses upon the shank of the hook, and throws the latch against the extremity of the hook. The end of the shank of the hook is provided with a stud, having formed upon it the large flat head. A cross head is secured in the arms of the yoke, and upon which the buckle tongue is placed. Side pieces are attached to the yoke, forming an oblong loop, through which the strap engaged by the buckle tongue passes. The strap is attached to the buckle by passing it upward through the loop, placing the buckle tongue through one of its perforations, drawing the strap down until the said tongue rests on one of the side pieces, and then passing the shorter end downward through the loop, and drawing it down tightly. The swivel connection between the buckle and snap permits of drawing upon the strap without injury to the strap, buckle, or snap. The loop formed at the lower end of the yoke by the connecting side pieces holds the strap firmly, and leather loops are dispensed with. The latch of the snap protects the spring, so that it is not easily injured.

IMPROVED CAR AXLE BOX.

James W. Hill, South St. Louis, Mo.—This invention relates to truck boxes for railroad car axles; and the nature of this invention consists in casting or otherwise applying, to the outer face of a truck box, a button head fastening in combination with an opening through one end of the lid or cover, whereby an inexpensive and safe attachment is secured. The cap or cover is constructed with an elliptical opening through one end, the longest diameter of which is in a direction with the length of the cap. When the cap is held upright the button head can be passed through the hole and turned upon the neck. The cap is thus safely attached to the box, and will not be liable to casual detachment whether it be left open or shut.

IMPROVED CAP.

Solomon Katz and William Katz, New York city.—The object of this invention is to furnish caps provided with inner sliding bands, which shall be so constructed that they may be lowered to cover and protect the back part of the head and neck, and may be raised within the cap, when not required for use, so as to be entirely out of sight and out of the way, and which shall not increase the thickness of the cap materially, or make it heavy or clumsy.

IMPROVED DOOR AND ALARM BELL.

Jefferson G. Wiggins, Seneca Falls, N. Y.—This invention relates to bell alarms for doors; and the nature of it consists in combining, with the knob and spindle of a door latch, an alarm bell, which may or may not be sounded by turning the knob to open the door, or it may be sounded from the outside of the door without turning the knob.

IMPROVED SPOOL HOLDER.

Frederick W. Claybrook, Hague, Va.—The spool holder is formed of two parts, one a device consisting of a spring wire whose ends are bent to adapt them to enter the eye of a spool, and the other an ornamental pin or hook adapted for attachment to the clothing on the shoulder or about the waist of the person crocheting. The two parts are hinged together, so that they have due freedom of movement.

IMPROVED PERFUMED CHARM.

Charles A. Atkinson, New York city.—The invention relates to an improved charm or personal ornament; and it consists in forming the body of the charm of porous earthenware to the desired configuration and scenting the same by the absorption of a perfume.

IMPROVED GAS DROP LIGHT.

William B. S. Taylor, New York city.—The lamp or light may be raised and lowered at will, within the stationary part or frame, as usual in drop lights. The gas-conducting tubes, which connect the light with the stationary part of the chandelier, are elastic and flexible, and are so attached and arranged on the sides of the light that they cannot be injured by the heat, which is the inevitable result when the tubing is attached above the light in the usual way.

IMPROVED FIRE ESCAPE.

Benjamin A. Richardson, Norfolk, Va.—The object of this invention is to save life and property in case of fire, by affording means for persons to safely descend from the windows or roof of a building. The improvement consists of linked sections composing an improved ladder. The links or side pieces of one section are about double the width of the side pieces of the other section, so that these sections will fold closely within each other. The sections gradually diminish in size from the middle section to the terminal sections, forming a long ladder, which, when it is folded, will occupy a very small space.

IMPROVED SUSPENDER END.

John H. Murfey, New York city.—This invention consists of a peculiar cord loop that is attached to the buckle fastener or clip, and to end pieces having holes for receiving buttons. The object of the invention is to provide a suspender end that will adjust itself, and that may be easily adapted to the requirements of different persons. The loops, instead of being fastened by a metallic clip, may be stitched into a leather or cloth fastening.

IMPROVED HOPPLE.

Benjamin F. Melton, Gainesville, Texas.—This invention relates to hopples for fettering animals when turned out to graze; and it consists of a metallic band composed of three equal parts, two of which are hinged to a third, and provided with a fastening, by means of which it may be secured to the leg of the animal. A link is secured in the joint between the parts by the rivet of the joint, and designed to receive a chain attached to another similar jointed band. The edges of the band are flared, and may be perforated, so that a lining may be attached. The hopple is to be worn by the animal below the pastern joint, and the chain connecting the two bands may be made adjustable.

IMPROVED FIRE ESCAPE.

Jules A. Tixier, Brooklyn, N. Y.—The object of this invention is to furnish a fire escape, which shall be simple and neat in construction, and at the same time small, so that it can be conveniently carried by travelers and used whenever there may be occasion. The invention consists in the grooved and perforated cylinder, cast solid with the frame, and provided with the loop and the single or double rope. The loop is passed around the waist of the person, who grasps the rope below the device in his hands, and passes out of the window, when his weight causes the said device to slide down the rope, the rapidity of descent being controlled by throwing more or less weight upon a rope which he holds in and allows to pass through his hands.

IMPROVED FEED COOKERS.

Mortimer B. Mills, De Witt, Iowa.—This invention has relation to boil ers for cooking feed for beasts; and the nature of the invention consists in the combination of a wooden barrel with a furnace, the fire chamber of which is extended well up in the barrel and surrounded by the water therein, and the smoke pipe is carried directly up through the top of the barrel. The object is to have a shell, which is a poor conductor of heat, and to obtain as large an amount of heating surface in a given space as possible. For the purpose of creating a very rapid circulation of water in the barrel, and also to obtain a large heating surface, the fire chamber is of less diameter than the interior of the barrel, so that a water circulating and heating space is left.

IMPROVED LOCK FOR POCKET BOOKS.

Emil Suhr, Brooklyn, N. Y., assignor to R. Neumann & Co., New York city.—The invention relates to a pocket book lock of simple and cheap construction, which is so made that the working parts are entirely hidden from view, and thereby a lock of neater appearance obtained; and it consists of a base plate having a spring plate riveted thereto, the spring plate being bent at the end to receive the pivots of the swinging face plate of the lock, which turns on the spring end, and is retained in open or closed position by the same. The face plate swings readily on the bearing of the spring plate, and is held reliably in closed or open position by the action of the spring.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

A Book worth having.—The "Artificer's Assistant" seems to be in great demand. (A condensed table of contents was published in this paper September 22d, last page. It's worth referring to).

For Sale low—Several Steam Launches, 25 to 50 feet, or would like to hear of routes to run them on; also one second-hand Band Saw Mill. S.E.Harthan, Worcester, Mass., Manuf. of Launches and Engines.

Blake's Belt Studs. The most durable fastening for rubber and leather belts. Greene, Tweed & Co., N. Y.

A brass 4 inch Turbine Waterwheel, with shaft, pulley, pipes, and Gem meter, for sale; $75. W. S. Loomis, Holyoke, Mass.

For Amateur Photographic Apparatus. Outfits with complete instructions. Price, from $5 to $30. Send stamp for information to E. Sackmann, 278 Pearl St., N. Y.

Best Pulleys and Couplings made; secured to shafts without keys, set-screws, bolts, or pins. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Safety Linen Hose for factories, hotels, and stores, at lowest rates. Greene, Tweed & Co., 18 Park Place, N.Y.

For the best Gate Valves of all kinds, apply to D. Kennedy & Co., 88 John St., N. Y.

Wood-working Machinery. A large stock of new and second-hand for sale low. Schenck's Machinery Depot, 36 Liberty St., N. Y.

Wanted—Complete set of good second-hand Machinery for Planing Mill, and making Mouldings, Sash, Doors, etc. Cash. Address P.O.Box 3058, N. Y. city.

Wanted—Machine for making Horseshoes. Address Hollidaysburg Iron and Nail Co., Hollidaysburg, Pa.

Stationary and Yacht Engines, Boilers, Propellers, and sets of Castings, furnished from 1 to 20 H. P.; also Steam Pumps for Yachts. Wm. J. Sanderson, 21 Church St., Syracuse, N. Y.

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For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Shaw's Noise-Quieting Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quiets all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N.Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Yacht and Stationary Engines from 2 to 20 H. P. The best for the price. N. W. Twiss, New Haven, Conn.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

Arbors or Mandrels hardened, ground perfectly true and durable. For machinists, jewelers, and others use. Send for circular. A. A. Pool & Co., Newark, N. J.

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

Chester Steel Castings Co. make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 222.

Silver Solder and small Tubing. John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.

For Boult's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B.C. Machinery Co., Battle Creek, Mich.

Best Glass Oilers. Cody & Ruthven, Cincinnati, O.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence. R. I.

Notes & Queries

(1) L. C. S. asks for a recipe for making bay rum? A. Bay rum is made by digesting the leaves of the bay plant, an aromatic plant grown in the West Indies, in rum, and subsequent distillation An imitation is made as follows: 3½ fluid drachms oil of bay, ½ fluid drachm oil of pimento, 1 fluid oz. acetic ether, 1 gallon alcohol, 3 quarts water. Mix, and after two weeks repose, filter.

(2) F. B. S. asks: What is best for making a small air pump airtight? The air seems to escape around the top of the cylinder, on the top of which is screwed a brass cap, through which passes the piston rod. A. Cut a disk of rubber and place in the cap, so as to fill it and fit nicely. Screw the cap to place.

(3) H. G. says: I notice in the SCIENTIFIC AMERICAN for September 15 an article on the increase of water in springs by the use of a siphon. Would a straight pipe leading into a spring that was completely bricked up and covered with earth answer as well as a siphon? A. No. The water must be conducted by the pipe to a point lower than the outlet of the spring.

(4) S. C. Q. asks how to join some clay pipes so that they will be rendered perfectly watertight? A. Warm the ends of the pipes, dip in melted pitch, press firmly together, and let them remain so until the pitch hardens.

(5) C. B. says: I have a pair of blue steel clock hands. I want to give them a dull black "ebony" appearance. A. Dissolve asphaltum in turpentine with gentle heat, and give the work one or two applications. The first coat must be thoroughly dry before the second is applied.

(6) J. T. P. says: I wish to remove some large poplar and walnut stumps from one of my fields. Can I blow them out with dynamite? A. In some parts of the West dynamite cartridges have been successfully used, by boring a hole under the stump with a long earth auger, inserting the cartridge, and firing it with fuse.

(7) J. M. asks how to remedy a gun that scatters the shot too much in shooting? A. Reducing the charge of powder or using a slower burning powder and selecting that size shot that will make the best target is one remedy. If the gun be worn at the muzzle by shooting, shorten it an inch or two. Sometimes reaming it with a lead plug and emery for a little distance down the muzzle may be effectual. There are many little things that affect the shooting of guns, which a gunsmith can best inform you. For directions to bronze a gun barrel, see (36) p. 203, No. 13, present volume.

(8) W. W. W. asks: 1. How to melt gold, such as old watch chains, and other old jewelry? A. Place the metal, pounded into small lumps, in a clean black lead crucible, and expose to a very bright red or white heat in a furnace until completely fused, when it may be run out. 2. Can I melt it in a common parlor stove? A. In quantities of more than a few dwts. at a time, probably not.

(9) E. B. L. asks: 1. How to finish up shelf brackets? A. Finish by coating once or twice with black baking japan, which must be dried in a kiln or oven. 2. How to finish the raised parts with yellow powder? A, The yellow finish is a light coating of bronze powder, which is put on by first varnishing the work with a thin varnish, and then apply the powder with a bit of leather, rubbing it on where the varnish was applied, or the bronze and the varnish can be mixed and applied with a small brush.

(10) W. C., of St. Johns, N. B., says: I have charge of a printing press and have great trouble in keeping the rollers clean. It seems almost impossible to get off a hundred clean impressions. The dirt seems to be like paper dust. The rollers work all clean, but the face of the type fills up. What is the cause of it, and how can I prevent it? A. To keep the impressions continuously clean and even is one of the most difficult lessons of the pressman to learn. The filling up of the type is caused either by the rollers being "green" from being new, or made so by washing in lye; or, more likely, in having an ink with too strong a body, which draws from the paper the light particles and leaves them on the type. If the rollers are green, wash in oil. If the trouble is with the ink, thin it out by adding oil, or procure a lighter bodied ink.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. L.—It contains lead and probably silver—you should have it assayed.—D. C. S.—Magnetite is, when in masses sufficiently free of foreign matters, one of the most valuable ores of iron. Its precise value depends much on the locality of the bed, facilities for mining or smelting, cost of transportation to market, etc. A quantitative analysis would be necessary to determine its richness.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Torpedo Defence. By F. P.

On Labor and Capital. By M. J.

Also inquiries and answers from the following:

H. D.—J. W. S.—A. M.—W. N. W.—B. B.—D. S.—W. M.—R. & Co.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes riding cultivators or buggy plows? Who publishes books on photography? Who makes and sells weather strips for doors, windows, etc.? Who makes and sells dynamite cartridges? Who makes wood brackets? Who makes knitting machines and hair weaving looms?" All such personal inquiries are printed as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

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10,164.—CORSET GORE.—T. S. Gilbert, Birmingham, Conn.
10,165.—HANGING BASKETS.—W. Hamilton, N. Y. city.
10,166.—CARPETS.—D. McNair, Boston, Mass.
10,167.—OIL CLOTH.—J. Meyer, Lansingburg, N. Y.
10,168.—CARPETS.—T. J. Stearns, Boston, Mass.
10,169 and 10,170.—CARPETS.—W. De Hart, Amsterdam, N. Y.
10,171.—CARPETS.—A. Hill, Amsterdam, N. Y.
10,172.—CARPETS.—C. Uster, Amsterdam, N. Y.

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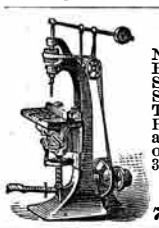

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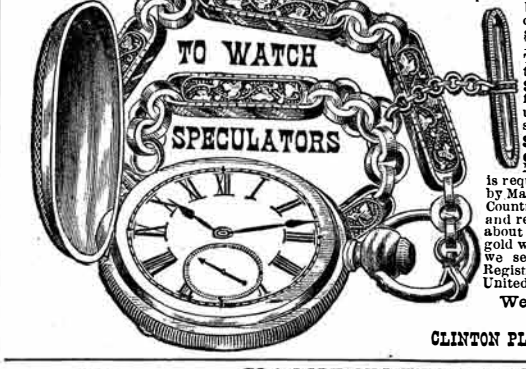

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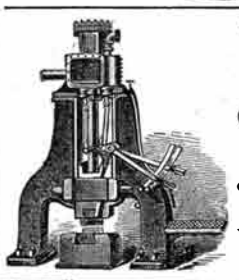

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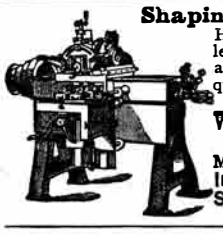

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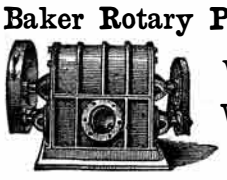

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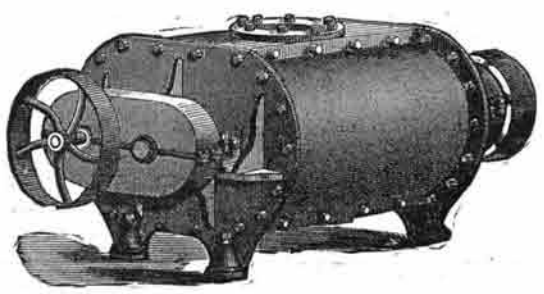

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